

United States Environmental Protection Agency  
Region 9

In the Matter of :

Iron Mountain Mine

Iron Mountain Mines, Inc.,

T.W. Arman,

Rhone-Poulenc, Inc.

Respondents

Proceeding under Section 106 of the  
Comprehensive Environmental Response,  
Compensation and Liability Act of 1980,  
as amended by the Superfund Amendments  
and Reauthorization Act of 1986,  
(42 U.S.C. § 9606)

Order No. 94-12

ADMINISTRATIVE ORDER  
FOR REMEDIAL DESIGN AND REMEDIAL ACTION  
AND OPERATIONS AND MAINTENANCE

# TABLE OF CONTENTS

I. INTRODUCTION AND JURISDICTION . . . . .	1
II. FINDINGS OF FACT . . . . .	2
III. CONCLUSIONS OF LAW AND DETERMINATIONS . . . . .	3
IV. NOTICE TO THE STATE . . . . .	4
V. ORDER . . . . .	4
VI. DEFINITIONS . . . . .	5
VII. NOTICE OF INTENT TO COMPLY . . . . .	5
VIII. PARTIES BOUND . . . . .	6
IX. WORK TO BE PERFORMED . . . . .	7
X. FAILURE TO ATTAIN PERFORMANCE STANDARDS . . . . .	15
XI. EPA PERIODIC REVIEW . . . . .	16
XII. ADDITIONAL RESPONSE ACTIONS . . . . .	16
XIII. ENDANGERMENT AND EMERGENCY RESPONSE . . . . .	17
XIV. EPA REVIEW OF SUBMISSIONS . . . . .	18
XV. PROGRESS REPORTS . . . . .	19
XVI. QUALITY ASSURANCE, SAMPLING AND DATA ANALYSIS . . . . .	19
XVII. COMPLIANCE WITH APPLICABLE LAWS . . . . .	20
XVIII. REMEDIAL PROJECT MANAGER . . . . .	21
XIX. ACCESS TO SITE NOT OWNED BY RESPONDENT(S) . . . . .	22
XX. SITE ACCESS AND DATA/DOCUMENT AVAILABILITY . . . . .	24
XXI. RECORD PRESERVATION . . . . .	26
XXII. DELAY IN PERFORMANCE . . . . .	27
XXIII. ASSURANCE OF ABILITY TO COMPLETE WORK . . . . .	28
XXIV. REIMBURSEMENT OF RESPONSE COSTS . . . . .	29
XXV. UNITED STATES NOT LIABLE . . . . .	30
XXVI. ENFORCEMENT AND RESERVATIONS . . . . .	31

1	XXVII. ADMINISTRATIVE RECORD . . . . .	32
2	XXVIII. EFFECTIVE DATE AND COMPUTATION OF TIME . . . . .	33
3	XXIX. OPPORTUNITY TO CONFER . . . . .	33
4	XXX. EFFECT ON PREVIOUS ORDERS . . . . .	34
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		

United States Environmental Protection Agency  
Region 9

In the Matter of : )  
Iron Mountain Mine ) Order No. 94-12  
Iron Mountain Mines, Inc., )  
T.W. Arman, )  
Rhone-Poulenc, Inc. )  
Respondents )  
Proceeding under Section 106 of the )  
Comprehensive Environmental Response, )  
Compensation and Liability Act of 1980, )  
as amended by the Superfund Amendments )  
and Reauthorization Act of 1986, )  
(42 U.S.C. § 9606) )

---

ADMINISTRATIVE ORDER  
FOR REMEDIAL DESIGN AND REMEDIAL ACTION  
AND OPERATIONS AND MAINTENANCE

I. INTRODUCTION AND JURISDICTION

1. This Order is issued to Respondents by the United States Environmental Protection Agency ("EPA") under the authority vested in the President of the United States by section 106(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended ("CERCLA"), 42 U.S.C. § 9606(a). This authority was delegated to the Administrator of EPA on January 23, 1987, by Executive Order 12580 (52 Fed. Reg. 2926, January 29, 1987), and was further delegated to EPA Regional Administrators on September 13, 1987 by EPA Delegation

1 No. 14-14-B. The Regional Administrator redelegated this  
2 authority to the Director, Hazardous Waste Management Division.

3 2. This Order directs Respondents to conduct necessary design  
4 and construction activities described in the Record of Decision  
5 for the Iron Mountain Mine site, dated September 24, 1993, to  
6 operate and maintain the treatment plant constructed pursuant to  
7 Order No. 93-01, and to maintain other remedial actions completed  
8 or to be completed by Respondents, as provided below.

9 II. FINDINGS OF FACT

10 3. This Order incorporates by reference the Findings of Fact  
11 contained in Order No. 93-01.

12 4. The Respondents identified in this paragraph are  
13 collectively referred to as "Respondents."

14 A. T.W. Arman and Iron Mountain Mines, Inc. (IMMI),  
15 Respondents, are the current owners and operators of Iron  
16 Mountain Mines, and have been the owners and operators since  
17 about December, 1976.

18 B. Rhone-Poulenc, Inc., (RP), Respondent, a New York  
19 corporation, is the legal successor to Mountain Copper Co., Ltd.,  
20 Stauffer Chemical Co., and Rhone-Poulenc Basic Chemicals Co.,  
21 Inc. Mountain Copper and Stauffer Chemical Co. were owners and  
22 operators of the facility at the time of disposal of hazardous  
23 substances. Rhone-Poulenc Basic Chemicals was the successor to  
24 Mountain Copper and Stauffer. Rhone-Poulenc Basic was merged  
25 into Rhone-Poulenc, Inc., effective December 31, 1992, and  
26 consequently is the successor to Rhone-Poulenc Basic Chemicals  
27 Co., Inc.

1 5. On November 3, 1992, EPA issued Respondents Order No. 93-01,  
2 which required Respondents to design and construct all necessary  
3 facilities to collect, convey and treat the discharges of acid  
4 mine drainage from the Richmond and Lawson portals (including  
5 facilities for disposal of treatment sludges). Order No. 93-01  
6 also required Respondents to excavate, consolidate, and cap seven  
7 waste piles. During 1993 to the present, Rhone-Poulenc has been  
8 designing and constructing an aerated simple mix treatment plant  
9 and related facilities pursuant to that Order, as subsequently  
10 amended. Rhone-Poulenc is currently designing the remedial  
11 action to consolidate and cap certain tailings piles at the  
12 facility. Rhone-Poulenc is expected to complete construction of  
13 this action by October 31, 1994.

14 6. On September 24, 1993, EPA selected treatment of the acid  
15 mine drainage from the Old/No. 8 Mine Seep as the remedial action  
16 to address the acid mine drainage from that source.

### 17 III. CONCLUSIONS OF LAW AND DETERMINATIONS

18 7. The Iron Mountain Mine Site is a "facility" as defined in  
19 section 101(9) of CERCLA, 42 U.S.C. § 9601(9).

20 8. Respondents are "persons" as defined in section 101(21) of  
21 CERCLA, 42 U.S.C. § 9601(21).

22 9. Respondents are "liable parties" as defined in section  
23 107(a) of CERCLA, 42 U.S.C. § 9607(a), and are subject to this  
24 Order under section 106(a) of CERCLA, 42 U.S.C. § 9606(a).

25 10. The copper, cadmium, zinc and acid mine drainage disposed of  
26 and released from the facility are "hazardous substances" as  
27 defined in section 101(14) of CERCLA, 42 U.S.C. § 9601(14).

1 11. These hazardous substances have been released, are being  
2 released and threaten to continue to be released from the Site  
3 into surface waters.

4 12. The disposal and migration of hazardous substances from the  
5 Site are a "release" as defined in section 101(22) of CERCLA, 42  
6 U.S.C. § 9601(22).

7 13. The potential for future migration of hazardous substances  
8 from the Site poses a threat of a "release" as defined in section  
9 101(22) of CERCLA, 42 U.S.C. § 9601(22).

10 14. The release of the hazardous substances from the facility  
11 may present an imminent and substantial endangerment to the  
12 public health or welfare or the environment.

13 15. The contamination and endangerment at this Site constitute  
14 an indivisible injury. The actions required by this Order are  
15 necessary to protect the public health, welfare, and the  
16 environment.

#### 17 IV. NOTICE TO THE STATE

18 16. Prior to issuing this Order, EPA notified the State of  
19 California Department of Toxic Substances Control, that EPA would  
20 be issuing this Order.

#### 21 V. ORDER

22 17. Based on the foregoing, Respondents are hereby ordered,  
23 jointly and severally, to comply with the following provisions,  
24 including but not limited to all attachments to this Order, all  
25 documents incorporated by reference into this Order, and all  
26 schedules and deadlines in this Order:

1 VI. DEFINITIONS

2 18. Unless otherwise expressly provided herein, terms used in  
3 this Order which are defined in CERCLA or in regulations  
4 promulgated under CERCLA shall have the meaning assigned to them  
5 in the statute or its implementing regulations. This Order also  
6 incorporates by reference the definitions of terms contained in  
7 Order No. 93-01, ¶ VI, whenever such terms are used in this Order  
8 or in the documents attached to this Order or incorporated by  
9 reference into this Order. In addition, "ROD III" or the "Old  
10 Mine/No. 8 ROD" shall mean the EPA Record of Decision relating to  
11 the Site, signed September 24, 1993, and all attachments thereto.

12 VII. NOTICE OF INTENT TO COMPLY

13 19. Respondents shall provide, not later than seven (7) days  
14 after the effective date of this Order, written notice to EPA's  
15 Remedial Project Manager (RPM) stating whether they will comply  
16 with the terms of this Order. If Respondents do not  
17 unequivocally commit to perform the work as provided by this  
18 amended Order, they shall be deemed to have violated this Order  
19 and to have failed or refused to comply with this Order.  
20 Respondent's written notice shall describe, using facts that  
21 exist on or prior to the effective date of this Order, any  
22 "sufficient cause" defenses asserted by Respondents under  
23 sections 106(b) and 107(c)(3) of CERCLA. The absence of a  
24 response by EPA to the notice required by this paragraph shall  
25 not be deemed to be acceptance of Respondent's assertions.

VIII. PARTIES BOUND

20. This Order shall apply to and be binding upon each Respondent identified in paragraph 4, their directors, officers, employees, agents, successors, and assigns. Respondents are jointly and severally responsible for carrying out all activities required by this Order. No change in the ownership, corporate status, or other control of any Respondents shall alter any of the Respondents' responsibilities under this Order.

21. Respondents shall provide a copy of this Order to any prospective owners or successors before a controlling interest in Respondent's assets, property rights, or stock are transferred to the prospective owner or successor. Respondents shall provide a copy of this Order to each contractor, sub-contractor, laboratory, or consultant retained to perform any Work under this Order, within seven (7) days after the effective date of this Order or on the date such services are retained, whichever date occurs later. Respondent(s) shall also provide a copy of this Order to each person representing any Respondents with respect to the Site or the Work and shall condition all contracts and subcontracts entered into hereunder upon performance of the Work in conformity with the terms of this Order. With regard to the activities undertaken pursuant to this Order, each contractor and subcontractor shall be deemed to be related by contract to the Respondents within the meaning of section 107(b)(3) of CERCLA, 42 U.S.C. § 9607(b)(3). Notwithstanding the terms of any contract, Respondents are responsible for compliance with this Order and for ensuring that their contractors, subcontractors and agents

1 comply with this Order, and perform any Work in accordance with  
2 this Order.

3 22. Within seven (7) days after the effective date of this Order  
4 each Respondent that owns real property comprising all or part of  
5 the Site shall record a copy or copies of this Order in the  
6 appropriate governmental office where land ownership and transfer  
7 records are filed or recorded. Respondents shall, within 15 days  
8 after the effective date of this Order, send notice of such  
9 recording and indexing to EPA.

10 23. Not later than sixty (60) days prior to any transfer of any  
11 real property interest in any property included within the Site,  
12 Respondents shall submit a true and correct copy of the transfer  
13 documents to EPA, and shall identify the transferee by name,  
14 principal business address and effective date of the transfer.

#### 15 IX. WORK TO BE PERFORMED

16 24. **Public information and meetings.** Respondents shall  
17 cooperate with EPA in providing information regarding the Work to  
18 the public. As requested by EPA, Respondents shall participate  
19 in the preparation of such information for distribution to the  
20 public and in public meetings which may be held or sponsored by  
21 EPA to explain activities at or relating to the Site.

22 25. **State participation.** Respondents shall submit copies of  
23 documents submitted pursuant to this section for EPA review to  
24 DTSC at the same time the documents are submitted to EPA. The  
25 State shall have the right to participate in all meetings  
26 required by this section.

27 26. **Enforceability.** All documents approved by EPA under this  
28

1 Order shall become enforceable provisions of this order and non-  
2 compliance with any approved document will be subject to  
3 penalties in the same manner as any other violation of this  
4 Order.

5 PROJECT MANAGER

6 27. All aspects of the Work to be performed by Respondents  
7 pursuant to this Order shall be under the direction and  
8 supervision of a qualified project manager the selection of whom  
9 shall be subject to approval by EPA. Within seven (7) days after  
10 the effective date of this Order, Respondents shall notify EPA in  
11 writing of the name and qualifications of the project manager,  
12 including primary support entities and staff, proposed to be used  
13 in carrying out Work under this Order. If at any time  
14 Respondents propose to use a different project manager,  
15 Respondents shall notify EPA and shall obtain approval from EPA  
16 before the new project manager performs any Work under this  
17 Order.

18 28. EPA will review Respondents' selection of a project manager  
19 according to the terms of this paragraph and Section XIV of this  
20 Order. If EPA disapproves of the selection of the project  
21 manager, Respondents shall submit to EPA within thirty (30) days  
22 after receipt of EPA's disapproval of the project manager  
23 previously selected, a list of project managers, including  
24 primary support entities and staff, that would be acceptable to  
25 Respondents. EPA will thereafter provide written notice to  
26 Respondents of the names of the project managers that are  
27 acceptable to EPA. Respondents may then select any approved

1 project manager from that list and shall notify EPA of the name  
2 of the project manager selected within twenty-one (21) days of  
3 EPA's designation of approved project managers.

4 OPERATION AND MAINTENANCE - ROD II REMEDIAL ACTIONS

5 29. **Treatment.** Upon EPA approval of the Performance Standards  
6 Verification Plan (PSVP) and the Operations and Maintenance Plan  
7 (O & M Plan) submitted pursuant to Order No. 93-01, and EPA  
8 notification to Respondent(s) that the Remedial Action has been  
9 fully performed in accordance with Order No. 93-01, Respondents  
10 shall conduct necessary start-up/shakedown operations and  
11 demonstrate compliance with the PSVP. After EPA notifies  
12 Respondents that start-up/shakedown operations have been  
13 satisfactorily completed, Respondents shall collect, convey and  
14 treat all acid mine drainage from the Richmond and Lawson Portals  
15 and dispose of the treatment residue in Brick Flat Pit in  
16 accordance with the EPA approved O & M Plan.

17 30. **Waste Piles.** Respondents shall maintain and monitor the  
18 waste pile disposal facilities constructed pursuant to Order No.  
19 93-01 to assure that these facilities do not release hazardous  
20 substances into the environment, in accordance with the EPA  
21 approved Operation and Maintenance Plan submitted pursuant to  
22 Order No. 93-01 for the disposal facilities.

23 DESIGN AND CONSTRUCTION - ROD III

24 31. Respondents shall design and construct the remedial actions  
25 selected in ROD III in accordance with ROD III (Attachment A to  
26 this Order) and the Concept Design (Attachment B to this Order),  
27 which are incorporated by reference to this Order, and as

1 outlined in this Order.

2 32. Within twenty-one (21) days after the effective date of this  
3 Order Respondents shall submit for EPA review and approval a  
4 brief Preliminary Project Delivery Analysis (PPDA) for design and  
5 construction of the remedial actions selected in ROD III. The  
6 PPDA may be submitted in the form of a letter. The PPDA shall  
7 include a schedule providing for completion of design and  
8 construction of the remedial actions no later than October 31,  
9 1994. The schedule in the PPDA shall include dates for at least  
10 the following:

- 11 (1) preliminary design review meeting;
- 12 (2) preliminary design;
- 13 (3) pre-final design submittal;
- 14 (4) final design submittal;
- 15 (5) pre-construction conference;
- 16 (6) submittal of Respondents' selection of the remedial  
17 action contractor;
- 18 (7) initiation of construction;
- 19 (8) identification of and satisfactory compliance with any  
20 and all applicable permitting requirements;
- 21 (9) development and submission of the draft final and final  
22 Operation and Maintenance Plan (O & M Plan);
- 23 (10) pre-final construction inspection;
- 24 (11) final construction inspection;
- 25 (12) implementation of the Contingency Plan;
- 26 (13) development and submission of the Performance Standards  
27 Verification Plan;

1 (14) Final Construction Report; and

2 (15) Remedial Action Report.

3 33. At the time of submitting the PPDA, Respondents shall notify  
4 EPA whether it will be necessary to submit revisions to the  
5 following documents prepared pursuant to Order No. 93-01 in order  
6 for such documents to adequately address the tasks required by  
7 this Order or whether Respondents will use the previously  
8 prepared documents:

9 (1) a Health and Safety Plan;

10 (2) a design Sampling and Analysis Plan;

11 (3) a Contingency Plan;

12 (4) a Construction Quality Assurance Plan (CQAP);

13 (5) a Construction Management Plan (CMP);

14 (6) a plan for gathering additional data or information.

15 If it will be necessary to revise any of the above documents to  
16 update them to address the tasks to be completed pursuant to this  
17 Order, the PPDA shall include a schedule for submittal of  
18 revisions. Revisions of the documents shall attain at least the  
19 standards described for such documents in Order No. 93-01.

20 34. The Final Design submittal shall include the final plans and  
21 specifications. Unless the documents have been previously  
22 submitted, the Final Design submittal shall also include any  
23 revised Construction Quality Assurance Plan (CQAP), Construction  
24 Management Plan, Sampling and Analysis Plan and Health and  
25 Safety/Contingency Plan. Any revised CQAP shall describe the  
26 approach to quality assurance and shall specify a quality  
27 assurance official (QA official), independent of the construction

1 contractor, to conduct a quality assurance program during the  
2 construction phase of the project.

3 IMPLEMENTATION OF REMEDIAL ACTION - ROD III

4 35. **Pre-construction conference.** Prior to construction of the  
5 remedial action, Respondents shall meet with the State and EPA in  
6 a pre-construction conference to discuss and resolve any  
7 outstanding issues with respect to construction.

8 36. The Respondents shall implement all remedial action tasks  
9 according to the EPA approved schedule. Unless otherwise  
10 directed by EPA, Respondents shall not commence remedial action  
11 at the site prior to EPA approval of the Final Design.

12 37. **Construction contractor.** If Respondent(s) seeks to retain a  
13 construction contractor to assist in the performance of the  
14 Remedial Action, then Respondent(s) shall submit a copy of the  
15 contractor solicitation documents to EPA and DTSC not later than  
16 five (5) days after publishing the solicitation documents.

17 Respondent(s) shall notify EPA promptly in writing of the name,  
18 title, and qualifications of any construction contractor proposed  
19 to be used in carrying out work under this Order upon selection  
20 of the contractor. If at any time Respondent(s) proposes to  
21 change the construction contractor, Respondent(s) shall notify  
22 EPA and shall obtain approval from EPA as provided in this  
23 paragraph, before the new construction contractor performs any  
24 work under this Order. If EPA disapproves of the selection of  
25 any contractor as the construction contractor, Respondent(s)  
26 shall submit a list of contractors that would be acceptable to  
27 them to EPA within thirty (30) days after receipt of EPA's

disapproval of the contractor previously selected.

38. Notwithstanding any action by EPA, Respondent(s) remain fully responsible for achievement of the Performance Standards in the Record of Decision. Nothing in this Order, or in EPA's approval of any submission under this Order, shall be deemed to constitute a warranty or representation of any kind by EPA that full performance of the Remedial Design or Remedial Action will achieve the Performance Standards set forth in ROD III.

Respondent's compliance with such approved documents does not foreclose EPA from seeking additional work to achieve the applicable performance standards.

**39. Pre-certification inspection.** Within thirty (30) days after Respondent(s) conclude that the Remedial Action has been fully performed, Respondent(s) shall so notify EPA and shall schedule and conduct a pre-certification inspection to be attended by Respondent(s) and EPA. Representatives of DTSC and the State and federal natural resource trustees shall have the opportunity to participate in the inspection. The pre-certification inspection shall be followed by a written report submitted within thirty (30) days of the inspection by a registered professional engineer and Respondents' Project Coordinator certifying that the Remedial Action has been completed in full satisfaction of the requirements of this Order. If, after completion of the pre-certification inspection and receipt and review of the written report, EPA determines that the Remedial Action or any portion thereof has not been completed in accordance with this Order, EPA shall notify Respondent(s) in writing of the activities that must

1 be undertaken to complete the Remedial Action and shall set forth  
2 in the notice a schedule for performance of such activities.  
3 Respondent(s) shall perform all activities described in the  
4 notice in accordance with the specifications and schedules  
5 established therein. If EPA concludes, following the initial or  
6 any subsequent certification of completion by Respondent(s) that  
7 the Remedial Action has been fully performed in accordance with  
8 this Order, EPA may notify Respondent(s) that the Remedial Action  
9 has been fully performed. EPA's notification shall be based on  
10 present knowledge and Respondent's certification to EPA, and  
11 shall not limit EPA's right to perform periodic reviews pursuant  
12 to section 121(c) of CERCLA, 42 U.S.C. § 9621(c), or to take or  
13 require any action that in the judgment of EPA is appropriate at  
14 the Site, in accordance with 42 U.S.C. §§ 9604, 9606, or 9607.

15 40. Upon EPA's approval of the construction of the remedial  
16 action selected in ROD III, Respondents shall collect, convey and  
17 treat all acid mine drainage from the Old Mine/No. 8 Seep and  
18 dispose of the treatment residue in accordance with the EPA  
19 approved Operation and Maintenance Plan.

20 41. **Off-site shipment.** Respondent(s) shall, prior to any off-  
21 site shipment of hazardous substances from the Site to an out-of-  
22 state waste management facility, provide written notification to  
23 the appropriate state environmental official in the receiving  
24 state and to EPA's RPM of such shipment of hazardous substances.  
25 However, the notification of shipments shall not apply to any  
26 off-Site shipments when the total volume of all shipments from  
27 the Site to the State will not exceed ten (10) cubic yards.

1 a. The notification shall be in writing, and shall include  
2 the following information, where available: (1) the name and  
3 location of the facility to which the hazardous substances  
4 are to be shipped; (2) the type and quantity of the  
5 hazardous substances to be shipped; (3) the expected  
6 schedule for the shipment of the hazardous substances; and  
7 (4) the method of transportation. Respondent(s) shall  
8 notify the receiving state of major changes in the shipment  
9 plan, such as a decision to ship the hazardous substances to  
10 another facility within the same state, or to a facility in  
11 another state.

12 b. Respondent(s) shall determine the identity of the  
13 receiving facility and state following the award of the  
14 contract for Remedial Action construction. Respondent(s)  
15 shall provide all relevant information, including  
16 information under the categories noted in paragraph (a)  
17 above, on the off-Site shipments as soon as practicable  
18 after the award of the contract and before the hazardous  
19 substances are actually shipped.

20 X. FAILURE TO ATTAIN PERFORMANCE STANDARDS

21 42. In the event that EPA determines that additional response  
22 activities are necessary to meet applicable Performance  
23 Standards, EPA may notify Respondents that additional response  
24 actions are necessary.

25 43. Unless otherwise stated by EPA, within thirty (30) days of  
26 receipt of notice from EPA that additional response activities  
27 are necessary to meet any applicable Performance Standards,

1 Respondents shall submit for approval by EPA a work plan for the  
2 additional response activities. The plan shall conform to the  
3 applicable requirements of sections IX, XVI, and XVII of this  
4 Order. Upon EPA's approval of the plan pursuant to Section XIV,  
5 Respondents shall implement the plan for additional response  
6 activities in accordance with the provisions and schedule  
7 contained therein.

#### 8 XI. EPA PERIODIC REVIEW

9 44. Under section 121(c) of CERCLA, 42 U.S.C. § 9621(c), and any  
10 applicable regulations, EPA may review the Site to assure that  
11 the Work performed pursuant to this Order adequately protects  
12 human health and the environment. Until such time as EPA  
13 certifies completion of the Work, Respondents shall conduct the  
14 requisite studies, investigations, or other response actions as  
15 determined necessary by EPA in order to permit EPA to conduct the  
16 review under section 121(c) of CERCLA. As a result of any review  
17 performed under this paragraph, Respondents may be required to  
18 perform additional Work or to modify Work previously performed.

#### 19 XII. ADDITIONAL RESPONSE ACTIONS

20 45. EPA may determine that in addition to the Work identified in  
21 this Order and attachments to this Order, additional response  
22 activities may be necessary to protect human health and the  
23 environment. If EPA determines that additional response  
24 activities are necessary, EPA may require Respondents to submit a  
25 work plan for additional response activities. EPA may also  
26 require Respondents to modify any plan, design, or other  
27 deliverable required by this Order, including any approved

1 modifications.

2 46. Not later than thirty (30) days after receiving EPA's notice  
3 that additional response activities are required pursuant to this  
4 Section, Respondents shall submit a work plan for the response  
5 activities to EPA for review and approval. Upon approval by EPA,  
6 the work plan is incorporated into this Order as a requirement of  
7 this Order and shall be an enforceable part of this Order. Upon  
8 approval of the work plan by EPA, Respondents shall implement the  
9 work plan according to the standards, specifications, and  
10 schedule in the approved work plan. Respondents shall notify EPA  
11 of their intent to perform such additional response activities  
12 within seven (7) days after receipt of EPA's request for  
13 additional response activities.

14 XIII. ENDANGERMENT AND EMERGENCY RESPONSE

15 47. In the event of any action or occurrence during the  
16 performance of the Work which causes or threatens to cause a  
17 release of a hazardous substance or which may present an  
18 immediate threat to public health or welfare or the environment,  
19 Respondents shall immediately take all appropriate action to  
20 prevent, abate, or minimize the threat, and shall immediately  
21 notify EPA's Remedial Project Manager (RPM) or, if the RPM is  
22 unavailable, EPA's Alternate RPM. If neither of these persons is  
23 available Respondents shall notify the EPA Emergency Response  
24 Unit, Region 9. Respondents shall take such action in  
25 consultation with EPA's RPM and in accordance with all applicable  
26 provisions of this Order, including but not limited to the Health  
27 and Safety Plan and the Contingency Plan. In the event that

1 Respondents fails to take appropriate response action as required  
2 by this Section, and EPA takes that action instead, Respondents  
3 shall reimburse EPA for all costs of the response action not  
4 inconsistent with the NCP. Respondents shall pay the response  
5 costs in the manner described in Section XXIV of this Order,  
6 within thirty (30) days of Respondent's receipt of demand for  
7 payment and a Regionally-prepared cost summary, which includes  
8 all direct and indirect costs incurred by EPA and the state and  
9 their contractors of the costs incurred.

10 48. Nothing in the preceding paragraph shall be deemed to limit  
11 any authority of the United States to take, direct, or order all  
12 appropriate action to protect human health and the environment or  
13 to prevent, abate, or minimize an actual or threatened release of  
14 hazardous substances on, at, or from the Site.

#### 15 XIV. EPA REVIEW OF SUBMISSIONS

16 49. After review of any deliverable, plan, report or other item  
17 which is required to be submitted for review and approval  
18 pursuant to this Order, EPA may: (a) approve the submission; (b)  
19 approve the submission with modifications; (c) disapprove the  
20 submission and direct Respondents to re-submit the document after  
21 incorporating EPA's comments; or (d) disapprove the submission  
22 and assume responsibility for performing all or any part of the  
23 response action. As used in this Order, the terms "approval by  
24 EPA," "EPA approval," or a similar term means the action  
25 described in paragraphs (a) or (b) of this paragraph.

26 50. In the event of approval or approval with modifications by  
27 EPA, Respondents shall proceed to take any action required by the

1 plan, report, or other item, as approved or modified by EPA.

2 51. Upon receipt of a notice of disapproval or a request for a  
3 modification, Respondents shall, within twenty-one (21) days or  
4 such longer time as specified by EPA in its notice of disapproval  
5 or request for modification, correct the deficiencies and  
6 resubmit the plan, report, or other item for approval.

7 Notwithstanding the notice of disapproval, or approval with  
8 modifications, Respondents shall proceed, at the direction of  
9 EPA, to take any action required by any non-deficient portion of  
10 the submission.

11 52. If any submission is not approved by EPA, Respondents shall  
12 be deemed to be in violation of this Order.

#### 13 XV. PROGRESS REPORTS

14 53. In addition to the other deliverables set forth in this  
15 Order, Respondents shall provide monthly progress reports to EPA  
16 with respect to actions and activities undertaken pursuant to  
17 this Order. The progress reports shall be submitted on or before  
18 the 15th day of each month following the effective date of this  
19 Order. Respondent's obligation to submit progress reports  
20 continues until EPA gives Respondents written notice that such  
21 progress reports are no longer necessary.

#### 22 XVI. QUALITY ASSURANCE, SAMPLING AND DATA ANALYSIS

23 54. Respondents shall use the quality assurance, quality  
24 control, and chain of custody procedures described in the "EPA  
25 NEIC Policies and Procedures Manual," May 1978, revised May 1986,  
26 EPA-330/9-78-001-R, EPA's "Guidelines and Specifications for  
27 Preparing Quality Assurance Program Documentation," June 1, 1987,

1 EPA's "Data Quality Objective Guidance," (EPA/540/G87/003 and  
2 004) and any amendments to these documents, while conducting all  
3 sample collection and analysis activities required herein by any  
4 plan. To provide quality assurance and maintain quality control,  
5 Respondents shall:

- 6 a. Use only laboratories which have a documented Quality  
7 Assurance Program that complies with EPA guidance  
document QAMS-005/80.
- 8 b. Ensure that the laboratory used by the Respondents for  
9 analyses, performs according to a method or methods  
10 deemed satisfactory to EPA and submits all protocols to  
be used for analyses to EPA at least 14 days before  
beginning analysis.
- 11 c. Ensure that EPA personnel and EPA's authorized  
12 representatives are allowed access to the laboratory  
and personnel utilized by the Respondents for analyses.

13 55. Respondents shall notify EPA not less than fourteen (14)  
14 days in advance of any sample collection activity not otherwise  
15 specified in the Statement of Work. At the request of EPA,  
16 Respondents shall allow split or duplicate samples to be taken by  
17 EPA or its authorized representatives, of any samples collected  
18 by Respondents with regard to the Site or pursuant to the  
19 implementation of this Order. In addition, EPA shall have the  
20 right to take any additional samples that EPA deems necessary.

21 XVII. COMPLIANCE WITH APPLICABLE LAWS

22 56. All activities by Respondents pursuant to this Order shall  
23 be performed in accordance with the requirements of all Federal  
24 and state laws and regulations. EPA has determined that the  
25 activities contemplated by this Order are consistent with the  
26 National Contingency Plan (NCP).

27 57. Except as provided in section 121(e) of CERCLA and the NCP,

1 no permit shall be required for any portion of the Work conducted  
2 entirely on-Site. Where any portion of the Work requires a  
3 Federal or state permit or approval, Respondents shall submit  
4 timely applications and take all other actions necessary to  
5 obtain and to comply with all such permits or approvals.

6 58. This Order is not, and shall not be construed to be, a  
7 permit issued pursuant to any Federal or state statute or  
8 regulation.

9 59. All materials removed from the Site shall be disposed of or  
10 treated at a facility approved by EPA's RPM and in accordance  
11 with section 121(d)(3) of CERCLA, 42 U.S.C. § 9621(d)(3); with  
12 the U.S. EPA "Revised Off-Site policy," OSWER Directive 9834.11,  
13 November 13, 1987; and with all other applicable Federal, state,  
14 and local requirements.

15 XVIII. REMEDIAL PROJECT MANAGER

16 60. All communications, whether written or oral, from  
17 Respondents to EPA shall be directed to EPA's Remedial Project  
18 Manager or Alternate Remedial Project Manager. Respondents  
19 shall submit to EPA three copies of all documents, including  
20 plans, reports, and other correspondence, which are developed  
21 pursuant to this Order, and shall send these documents by  
22 certified mail or overnight mail to EPA's Remedial Project  
23 Manager:

24 Rick Sugarek  
25 United States Environmental Protection Agency  
26 Region 9  
27 75 Hawthorne Street  
28 San Francisco, California 94105  
(415) 744-2226

1 61. EPA has the unreviewable right to change its Remedial  
2 Project Manager. If EPA changes its Remedial Project Manager,  
3 EPA will inform Respondents in writing of the name, address, and  
4 telephone number of the new Remedial Project Manager.

5 62. EPA's RPM shall have the authority lawfully vested in a  
6 Remedial Project Manager (RPM) and On-Scene Coordinator (OSC) by  
7 the National Contingency Plan, 40 C.F.R. Part 300. EPA's RPM  
8 shall have authority, consistent with the National Contingency  
9 Plan, to halt any work required by this Order, and to take any  
10 necessary response action.

11 63. Within ten (10) days after the effective date of this Order,  
12 Respondents shall designate a Project Coordinator and shall  
13 submit the name, address, and telephone number of the Project  
14 Coordinator to EPA for review and approval. Respondents' Project  
15 Coordinator shall be responsible for overseeing Respondents'  
16 implementation of this Order. If Respondents wishes to change  
17 their Project Coordinator, Respondents shall provide written  
18 notice to EPA, five (5) days prior to changing the Project  
19 Coordinator, of the name and qualifications of the new Project  
20 Coordinator. Respondents selection of a Project Coordinator  
21 shall be subject to EPA approval.

22 XIX. ACCESS TO SITE NOT OWNED BY RESPONDENT(S)

23 64. If the Site, the off-Site area that is to be used for  
24 access, property where documents required to be prepared or  
25 maintained by this Order are located, or other property subject  
26 to or affected by the clean up, is owned in whole or in part by  
27 parties other than those bound by this Order, Respondent(s) will

1 obtain, or use its (their) best efforts to obtain, site access  
2 agreements from the present owner(s) within 30 days of the  
3 effective date of this Order. Such agreements shall provide  
4 access for EPA, its contractors and oversight officials, the  
5 state and its contractors, and Respondent(s) or Respondent(s)  
6 authorized representatives and contractors, and such agreements  
7 shall specify that Respondent(s) is not EPA's representative with  
8 respect to liability associated with Site activities.

9 Respondent(s) shall save and hold harmless the United States and  
10 its officials, agents, employees, contractors, subcontractors, or  
11 representatives for or from any and all claims or causes of  
12 action or other costs incurred by the United States including but  
13 not limited to attorneys fees and other expenses of litigation  
14 and settlement arising from or on account of acts or omissions of  
15 Respondent(s), its (their) officers, directors, employees,  
16 agents, contractors, subcontractors, and any persons acting on  
17 their behalf or under their control, in carrying out activities  
18 pursuant to this Order, including any claims arising from any  
19 designation of Respondent(s) as EPA's authorized  
20 representative(s) under section 104(e) of CERCLA. Copies of such  
21 agreements shall be provided to EPA prior to Respondent's  
22 initiation of field activities. Respondent's best efforts shall  
23 include providing reasonable compensation to any off-Site  
24 property owner. If access agreements are not obtained within the  
25 time referenced above, Respondent(s) shall immediately notify EPA  
26 of its failure to obtain access. Subject to the United States'  
27 non-reviewable discretion, EPA may use its legal authorities to

1 obtain access for the Respondent(s), may perform those response  
2 actions with EPA contractors at the property in question, or may  
3 terminate the Order if Respondent(s) cannot obtain access  
4 agreements. If EPA performs those tasks or activities with  
5 contractors and does not terminate the Order, Respondent(s) shall  
6 perform all other activities not requiring access to that  
7 property, and shall reimburse EPA, pursuant to Section XXIV of  
8 this Order, for all costs incurred in performing such activities.  
9 Respondent(s) shall integrate the results of any such tasks  
10 undertaken by EPA into its reports and deliverables.

11 Respondent(s) shall reimburse EPA, pursuant to Section XXIV of  
12 this Order, for all response costs (including attorney fees)  
13 incurred by the United States to obtain access for Respondent(s).

#### 14 XX. SITE ACCESS AND DATA/DOCUMENT AVAILABILITY

15 65. Respondents shall allow EPA and its authorized  
16 representatives and contractors to enter and freely move about  
17 all property at the Site and off-Site areas subject to or  
18 affected by the work under this Order or where documents required  
19 to be prepared or maintained by this Order are located, for the  
20 purposes of inspecting conditions, activities, the results of  
21 activities, records, operating logs, and contracts related to the  
22 Site or Respondents and its representatives or contractors  
23 pursuant to this Order; reviewing the progress of the Respondents  
24 in carrying out the terms of this Order; conducting tests as EPA  
25 or its authorized representatives or contractors deem necessary;  
26 using a camera, sound recording device or other documentary type  
27 equipment; and verifying the data submitted to EPA by

1 Respondents. Respondents shall allow EPA and its authorized  
2 representatives to enter the Site, to inspect and copy all  
3 records, files, photographs, documents, sampling and monitoring  
4 data, and other writings related to work undertaken in carrying  
5 out this Order. Nothing herein shall be interpreted as limiting  
6 or affecting EPA's right of entry or inspection authority under  
7 Federal law.

8 66. Respondents may assert a claim of business confidentiality  
9 covering part or all of the information submitted to EPA pursuant  
10 to the terms of this Order under 40 C.F.R. § 2.203, provided such  
11 claim is not inconsistent with section 104(e)(7) of CERCLA, 42  
12 U.S.C. § 9604(e)(7) or other provisions of law. This claim shall  
13 be asserted in the manner described by 40 C.F.R. § 2.203(b) and  
14 substantiated by Respondents at the time the claim is made.  
15 Information determined to be confidential by EPA will be given  
16 the protection specified in 40 C.F.R. Part 2. If no such claim  
17 accompanies the information when it is submitted to EPA, it may  
18 be made available to the public by EPA or the state without  
19 further notice to the Respondents. Respondents shall not assert  
20 confidentiality claims with respect to any data related to Site  
21 conditions, sampling, or monitoring.

22 67. Respondents shall maintain for the period during which this  
23 Order is in effect, an index of documents that Respondents claims  
24 contain confidential business information. The index shall  
25 contain, for each document, the date, author, addressee, and  
26 subject of the document. Upon written request from EPA,  
27 Respondents shall submit a copy of the index to EPA.

XXI. RECORD PRESERVATION

68. Respondents shall provide to EPA upon request, copies of all documents and information within their possession and/or control or that of their contractors or agents relating to activities at the Site or to the implementation of this Order, including but not limited to sampling, analysis, chain of custody records, manifests, trucking logs, receipts, reports, sample traffic routing, correspondence, or other documents or information related to the Work. Respondents shall also make available to EPA for purposes of investigation, information gathering, or testimony, their employees, agents, or representatives with knowledge of relevant facts concerning the performance of the Work.

69. Until ten (10) years after EPA provides notice that Respondents have completed the tasks required by this Order, each Respondent shall preserve and retain all records and documents in its possession or control, including the documents in the possession or control of their contractors and agents on and after the effective date of this Order that relate in any manner to the Site. At the conclusion of this document retention period, Respondents shall notify the United States at least ninety (90) calendar days prior to the destruction of any such records or documents, and upon request by the United States, Respondents shall deliver any such records or documents to EPA.

70. Until ten (10) years after EPA provides notice that Respondents have completed the tasks required by this Order, Respondents shall preserve, and shall instruct their contractors

1 and agents to preserve, all documents, records, and information  
2 of whatever kind, nature or description relating to the  
3 performance of the Work. Upon the conclusion of this document  
4 retention period, Respondents shall notify the United States at  
5 least ninety (90) days prior to the destruction of any such  
6 records, documents or information, and, upon request of the  
7 United States, Respondents shall deliver all such documents,  
8 records and information to EPA.

9 71. Within 30 days after the effective date of this Order,  
10 Respondents shall submit a written certification to EPA's RPM  
11 that they have not altered, mutilated, discarded, destroyed or  
12 otherwise disposed of any records, documents or other information  
13 relating to their potential liability with regard to the Site  
14 since notification of potential liability by the United States or  
15 the State or the filing of suit against it regarding the Site.  
16 Respondents shall not dispose of any such documents without prior  
17 approval by EPA. Respondents shall, upon EPA's request and at no  
18 cost to EPA, deliver the documents or copies of the documents to  
19 EPA.

#### 20 XXII. DELAY IN PERFORMANCE

21 72. Any delay in performance of this Order that, in EPA's  
22 judgment, is not properly justified by Respondents under the  
23 terms of this paragraph shall be considered a violation of this  
24 Order. Any delay in performance of this Order shall not affect  
25 Respondents obligations to fully perform all obligations under  
26 the terms and conditions of this Order.

27 73. Respondents shall notify EPA of any delay or anticipated  
28

1 delay in performing any requirement of this Order. Such  
2 notification shall be made by telephone to EPA's RPM within forty  
3 eight (48) hours after Respondents first knew or should have  
4 known that a delay might occur. Respondents shall adopt all  
5 reasonable measures to avoid or minimize any such delay. Within  
6 five (5) business days after notifying EPA by telephone,  
7 Respondents shall provide written notification fully describing  
8 the nature of the delay, any justification for delay, any reason  
9 why Respondents should not be held strictly accountable for  
10 failing to comply with any relevant requirements of this Order,  
11 the measures planned and taken to minimize the delay, and a  
12 schedule for implementing the measures that will be taken to  
13 mitigate the effect of the delay. Increased costs or expenses  
14 associated with implementation of the activities called for in  
15 this Order is not a justification for any delay in performance.

16 XXIII. ASSURANCE OF ABILITY TO COMPLETE WORK

17 74. Respondents shall demonstrate their ability to complete the  
18 Work required by this Order and to pay all claims that arise from  
19 the performance of the Work by obtaining and presenting to EPA  
20 within thirty (30) days after approval of the Work Plan, one of  
21 the following: (1) a performance bond; (2) a letter of credit;  
22 (3) a guarantee by a third party; or (4) internal financial  
23 information to allow EPA to determine that Respondents has (have)  
24 sufficient assets available to perform the Work. Respondents  
25 shall demonstrate financial assurance in an amount no less than  
26 the estimate of cost for the activities required by the Statement  
27 of Work. If Respondents seeks to demonstrate ability to complete

1 the remedial action by means of internal financial information,  
2 or by guarantee of a third party, they shall re-submit such  
3 information annually, on the anniversary of the effective date of  
4 this Order. If EPA determines that such financial information is  
5 inadequate, Respondents shall, within thirty (30) days after  
6 receipt of EPA's notice of determination, obtain and present to  
7 EPA for approval one of the other three forms of financial  
8 assurance listed above. (a) At least seven (7) days prior to  
9 commencing any work at the Site pursuant to this Order,  
10 Respondents shall submit to EPA a certification that Respondents  
11 or their contractors and subcontractors have adequate insurance  
12 coverage or have indemnification for liabilities for injuries or  
13 damages to persons or property which may result from the  
14 activities to be conducted by or on behalf of Respondents  
15 pursuant to this Order. Respondents shall ensure that such  
16 insurance or indemnification is maintained for the duration of  
17 the Work required by this Order.

#### 18 XXIV. REIMBURSEMENT OF RESPONSE COSTS

19 75. Respondents shall reimburse EPA, upon written demand, for  
20 all response costs incurred by the United States in overseeing  
21 Respondent's implementation of the requirements of this Order or  
22 in performing any response action which Respondents fails to  
23 perform in compliance with this Order. EPA may submit to  
24 Respondents on a periodic basis an accounting of all response  
25 costs incurred by the United States with respect to this Order.  
26 EPA's certified Agency Financial Management System summary data  
27 (SPUR Reports), or such other summary as certified by EPA, shall

1 serve as basis for payment demands.

2 76. Respondents shall, within thirty (30) days of receipt of  
3 each EPA accounting, remit a certified or cashier's check for the  
4 amount of those costs. Interest shall accrue from the later of  
5 the date that payment of a specified amount is demanded in  
6 writing or the date of the expenditure. The interest rate is the  
7 rate established by the Department of the Treasury pursuant to 31  
8 U.S.C. § 3717 and 4 C.F.R. § 102.13.

9 77. Checks shall be made payable to the Hazardous Substances  
10 Superfund and shall include the name of the Site, the Site  
11 identification number, the account number and the title of this  
12 Order. Checks shall be forwarded to:

13 U.S. Environmental Protection Agency  
14 Superfund Accounting  
15 P.O. Box 360863M  
Pittsburgh, PA 15251

16 78. Respondents shall send copies of each transmittal letter and  
17 check to the EPA's RPM.

18 XXV. UNITED STATES NOT LIABLE

19 79. The United States, by issuance of this Order, assumes no  
20 liability for any injuries or damages to persons or property  
21 resulting from acts or omissions by Respondents, or its (their)  
22 directors, officers, employees, agents, representatives,  
23 successors, assigns, contractors, or consultants in carrying out  
24 any action or activity pursuant to this Order. Neither EPA nor  
25 the United States may be deemed to be a party to any contract  
26 entered into by Respondents or its (their) directors, officers,  
27 employees, agents, successors, assigns, contractors, or

1 consultants in carrying out any action or activity pursuant to  
2 this Order.

3 XXVI. ENFORCEMENT AND RESERVATIONS

4 80. EPA reserves the right to bring an action against  
5 Respondents under section 107 of CERCLA, 42 U.S.C. § 9607, for  
6 recovery of any response costs incurred by the United States  
7 related to this Order and not reimbursed by Respondents. This  
8 reservation shall include but not be limited to past costs,  
9 direct costs, indirect costs, the costs of oversight, the costs  
10 of compiling the cost documentation to support oversight cost  
11 demand, as well as accrued interest as provided in section 107(a)  
12 of CERCLA.

13 81. Notwithstanding any other provision of this Order, at any  
14 time during the response action, EPA may perform its own studies,  
15 complete the response action (or any portion of the response  
16 action) as provided in CERCLA and the NCP, and seek reimbursement  
17 from Respondents for its costs, or seek any other appropriate  
18 relief.

19 82. Nothing in this Order shall preclude EPA from taking any  
20 additional enforcement actions, including modification of this  
21 Order or issuance of additional Orders, and/or additional  
22 remedial or removal actions as EPA may deem necessary, or from  
23 requiring Respondents in the future to perform additional  
24 activities pursuant to CERCLA, 42 U.S.C. § 9606(a), et seq., or  
25 any other applicable law. Respondents shall be liable under  
26 CERCLA section 107(a), 42 U.S.C. § 9607(a), for the costs of any  
27 such additional actions.

1 83. Notwithstanding any provision of this Order, the United  
2 States hereby retains all of its information gathering,  
3 inspection and enforcement authorities and rights under CERCLA,  
4 RCRA and any other applicable statutes or regulations.

5 84. Respondents shall be subject to civil penalties under  
6 section 106(b) of CERCLA, 42 U.S.C. § 9606(b), of not more than  
7 \$25,000 for each day in which Respondents willfully violates, or  
8 fails or refuses to comply with this Order without sufficient  
9 cause. In addition, failure to properly provide response action  
10 under this Order, or any portion hereof, without sufficient  
11 cause, may result in liability under section 107(c)(3) of CERCLA,  
12 42 U.S.C. § 9607(c)(3), for punitive damages in an amount at  
13 least equal to, and not more than three times the amount of any  
14 costs incurred by the Fund as a result of such failure to take  
15 proper action.

16 85. Nothing in this Order shall constitute or be construed as a  
17 release from any claim, cause of action or demand in law or  
18 equity against any person for any liability it may have arising  
19 out of or relating in any way to the Site.

20 86. If a court issues an order that invalidates any provision of  
21 this Order or finds that Respondents has sufficient cause not to  
22 comply with one or more provisions of this Order, Respondents  
23 shall remain bound to comply with all provisions of this Order  
24 not invalidated by the court's order.

25 XXVII. ADMINISTRATIVE RECORD

26 87. Upon request by EPA, Respondents must submit to EPA all  
27 documents related to the selection of the response action for  
28

1 possible inclusion in the administrative record file.

2 XXVIII. EFFECTIVE DATE AND COMPUTATION OF TIME

3 88. This Order shall be effective 15 days after the Order is  
4 signed by the Director, Hazardous Waste Management Division. All  
5 times for performance of ordered activities shall be calculated  
6 from this effective date.

7 XXIX. OPPORTUNITY TO CONFER

8 89. Respondents may, within ten (10) days after the date this  
9 Order is signed, request a conference with EPA's Director,  
10 Hazardous Waste Management Division, to discuss this Order. If  
11 requested, the conference shall occur no later than ten (10) days  
12 after the request is made and shall be held at EPA Region 9, 75  
13 Hawthorne Street, San Francisco, CA. The Director may designate  
14 an alternate to meet with Respondents in the event of a schedule  
15 conflict.

16 90. The purpose and scope of the conference shall be limited to  
17 issues involving the implementation of the response actions  
18 required by this Order and the extent to which Respondents  
19 intends to comply with this Order. This conference is not an  
20 evidentiary hearing, and does not constitute a proceeding to  
21 challenge this Order. It does not give Respondents a right to  
22 seek review of this Order, or to seek resolution of potential  
23 liability, and no official stenographic record of the conference  
24 will be made. At any conference held pursuant to Respondent's  
25 request, Respondents may appear in person or by an attorney or  
26 other representative.

27 91. Requests for a conference must be by telephone followed by  
28

1 written confirmation mailed that day to

2 Rick Sugarek  
3 United States Environmental Protection Agency  
4 Region 9  
5 75 Hawthorne Street  
6 San Francisco, California 94105  
7 (415) 744-2226

8 XXX. EFFECT ON PREVIOUS ORDERS

9 92. Nothing in this order shall be construed to excuse any non-  
10 compliance with any previous order issued to Respondents.

11 93. Except as expressly provided herein, nothing in this order  
12 shall be construed as amending any previous order issued to  
13 Respondents.

14 So Ordered, this 19<sup>th</sup> day of April, 1994.

15 BY: 

16 Jeff Zelickson  
17 Director, Hazardous Waste Management Division  
18 U.S. Environmental Protection Agency, Region 9

19 Attachments:

20 Attachment A - Record of Decision, dated September 24, 1993  
21 Attachment B - Concept Design  
22  
23  
24  
25  
26  
27  
28

ATTACHMENT A  
IRON MOUNTAIN MINE  
RECORD OF DECISION  
OLD/NO. 8 MINE SEEP OPERABLE UNIT

**Record of Decision  
Old/No. 8 Seep  
Iron Mountain Mine  
Shasta County, California**

**September 24, 1993**

**U.S. Environmental Protection Agency  
Region IX  
75 Hawthorne Street  
San Francisco, California 94105**

## CONTENTS

	Page
The Declaration	1
I. Site Name and Location	1
II. Statement of Basis and Purpose	1
III. Assessment of the Site	2
IV. Description of the Selected Remedy	3
V. Statutory Determinations	4
The Decision Summary	7
I. Site Name, Location, and Description	7
II. Site History and Enforcement Activities	13
III. Highlights of Community Participation	17
IV. Scope and Role of the Operable Unit Within Site Strategy	19
V. Site Characteristics	20
VI. Summary of Site Risks	21
VII. Description of Alternatives	25
VIII. Alternative Comparisons	34
IX. The Selected Remedy	44
X. Statutory Determinations	47
XI. Documentation of Significant Changes	54
 Tables	
1 Summary of Water Quality and Flow Data for Old/No. 8 Mine Seep, 1978 to 1990	20
2 Maximum Contaminant Levels Specified by Selected ARARs ( $\mu\text{g/l}$ )	39
3 Summary of Overall Protection of Human Health and the Environment and Achievement of ARARs	40
4 Summary of Costs	42
5 Incremental Cost Summary for Alternative O/N8-1 (\$ x 1,000)	47
6 Incremental Annual Operation and Maintenance Cost Summary for Alternative O/N8-1 (\$ x 1,000)	48

## **CONTENTS (continued)**

	<b>Page</b>
<b>Figures</b>	
1      Location of Iron Mountain Site	8
2      Screening of Remedial Technologies for Mine Portals	28
3      Screening of Remedial Technologies for Waste Piles	29
4      HDS/Simple Mix Lime Neutralization	31
5      Generalized Flow Schematic—HDS/Simple Mix Treatment of Acid Mine Drainage	32
6      Copper Cementation Facilities	35

# **RECORD OF DECISION IRON MOUNTAIN MINE SHASTA COUNTY, CALIFORNIA**

## **THE DECLARATION**

### **I. SITE NAME AND LOCATION**

Iron Mountain Mine  
Shasta County, California (near Redding, California)

### **II. STATEMENT OF BASIS AND PURPOSE**

This decision document presents the selected interim remedial action for control of heavy-metal-bearing acidic discharges, termed acid mine drainage, or AMD, from the Old and No. 8 Mines into Slickrock Creek. These discharges are the third largest source of AMD at the Iron Mountain Mine Superfund Site. Slickrock Creek is a tributary of Spring Creek, which in turn is a tributary of the Sacramento River. Slickrock Creek is on the south side of the Iron Mountain Mine (IMM) site. The IMM site is located about 9 miles northwest of Redding, California.

The selected interim remedial action is to collect and treat the AMD from Old/No. 8 Mine Seep. The selected interim remedial action was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based upon the administrative record for this site.

The Natural Resource Trustees Council, which includes both State and Federal resource trustees for the Site, concurs with the selection of treatment and the High Density Sludge (HDS) process option as the interim remedial action for the Old/No. 8 Mine Seep acid mine drainage discharges.

The California Department of Toxic Substances Control (DTSC) and Regional Water Quality Control Board (RWQCB) concur with the selection of lime treatment and use of a process option that will produce a dense sludge as the interim remedial action for the Old/No. 8 Mine Seep acid mine drainage discharges. However, DTSC and RWQCB have encouraged EPA to fully evaluate the Aerated Simple Mix (ASM) process proposed by Stauffer Management Company (SMC) as an alternative to the HDS process. EPA has reviewed recently available treatability study data that indicate that the ASM process will not produce the required dense sludges that DTSC and RWQCB agree are necessary. EPA will review this information with the DTSC and RWQCB and will continue to assess any subsequently developed information.

### III. ASSESSMENT OF THE SITE

Heavy-metal-laden AMD is released from several, and possibly all, of the inactive mine workings at IMM and from the numerous waste piles on the mine property. The AMD drainage discharges to surface waters (which include Boulder, Slickrock, and Spring Creeks, the Spring Creek Reservoir, Keswick Reservoir, and the Sacramento River), causing severe environmental impacts and posing a potential threat to human health. The Sacramento River is a major fishery and source of drinking water for Redding. The National Oceanic and Atmospheric Administration (NOAA) has identified the affected area as the most important salmon habitat in California. Under the Clean Water Act §304(l) inventory of impaired water bodies and the toxic point sources affecting the water bodies, EPA identified the IMM site as the largest such discharger of toxic metals in the United States.

EPA has identified control of AMD sources in the Old/No. 8 Mine Seep Operable Unit as a major step in the ultimate control of discharges of contamination from the IMM site. The Old/No. 8 Mine Seep is the third largest source of AMD at the site. Actual or threatened releases of AMD from this site, if not addressed by implementing the response action selected in the Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment.

The Old/No. 8 Mine Seep Operable Unit (OU) includes the AMD discharges from the seeps which emerge from the north slope of the Slickrock Creek valley in the vicinity of several portals of the Old Mine and No. 8 Mine. The mine portals are covered by landslides, and the mines are not accessible.

The AMD discharged to Slickrock Creek contains high concentrations of copper, cadmium, and zinc and is the primary exposure pathway. The principal threat posed by these releases is the creation of conditions toxic to aquatic life in the receiving waters, most importantly, the Sacramento River. The Sacramento River supports a valuable fishery that includes four species of chinook salmon, steelhead, and resident trout. The Winter-Run Chinook Salmon has been designated as a threatened species under the Endangered Species Act.

The ROD for the Old/No. 8 Mine Seep Operable Unit (OU) is the third ROD for the IMM site. The first ROD for the Site, signed in October 1986, provided limited source control actions to begin lessening the AMD discharges and provided water management capability to manage the ongoing AMD releases to surface waters. Specific activities authorized by the 1986 ROD include a diversion of Slickrock Creek around sulfide-bearing landslide debris, diversion of Upper Spring Creek in the Boulder Creek drainage, and a partial cap of Brick Flat Pit. All of these projects have been completed. The 1986 ROD also authorized the enlargement of the Spring Creek Debris Dam and the diversion of the South Fork of Spring Creek. The enlargement of Spring Creek Diversion Dam is currently being designed by the U.S. Bureau of Reclamation under an agreement with EPA.

The second ROD for the IMM site was signed on September 30, 1992. It provided for an interim remedial action to treat AMD from the Richmond portal and the Lawson portal in the Boulder Creek Operable Unit. This action addressed the two largest sources of heavy-metal-laden AMD at the site. The design of the AMD collection and conveyance system, the treatment system, and the sludge disposal in Brick Flat Pit is underway.

To achieve the remedial action objectives of the Superfund action at the IMM site, EPA expects to require a further study or studies for the sources in the Slickrock Creek drainage not addressed in today's Record of Decision; other sources in the Boulder Creek drainage; sediments in Spring Creek, Spring Creek Reservoir, Keswick Reservoir, and the Sacramento River; contaminated groundwater; and other sources of contamination. The additional study will also assess potential water management options, including the need to coordinate releases of acidic waters with Central Valley Project water releases. Any further study will also consider resource recovery and source control. EPA is currently developing a work plan for this additional Remedial Action/Feasibility Study (RI/FS) activity, and this study will consider achieving all Applicable, or Relevant, and Appropriate Requirements (ARARs) for the actions.

#### **IV. DESCRIPTION OF THE SELECTED REMEDY**

The remedy selected in this decision document addresses the principal threat posed by contaminant releases from sources within the Slickrock Creek watershed at the IMM site through collecting and treating the Old/No. 8 Mine Seep discharge.

The major components of the selected remedy include:

- Construction of necessary structures, pipelines, pumping stations, and equalization to provide for delivery of all AMD flows from the Old/No. 8 Mine Seep to the treatment facility.
- Treatment facilities to perform chemical neutralization/precipitation treatment of all of the Old/No. 8 Mine Seep AMD using the lime high density sludge (HDS)/simple mix treatment process option to meet the performance standards of 40 C.F.R. Part 440, which have been determined to be relevant and appropriate to this application. Discharges to lower Spring Creek, Boulder Creek, and Slickrock Creek shall comply with the effluent limitations of 40 C.F.R. §§440.102(a) and 440.103(a), except for the limitation on pH and total suspended solids (TSS). Discharges to Flat Creek shall also comply with the pH and TSS requirements of 40 C.F.R. §440.102(a).
- Disposal of treatment residuals onsite in the inactive open pit mine, Brick Flat Pit. The design of the improvements to Brick Flat Pit to function as a disposal facility shall comply with the requirements of the Toxic Pits Control Act and California requirements for disposal of mining wastes.

## **V. STATUTORY DETERMINATIONS**

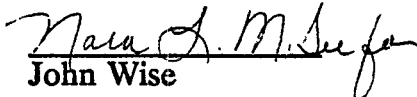
This interim action is protective of human health and the environment. The selected remedy essentially eliminates the potential exposure and the resultant threats to human health and the environment from the sources and pathways addressed in this interim action. The Old/No. 8 Mine Seep Operable Unit provides for an interim action that is not expected to be final and does not address all of the sources of discharges from the IMM site. The selected remedy, therefore, cannot be expected to be fully protective of human health and the environment. Further remedial actions are required.

This interim action complies with (or waives) Federal and State ARARs for this limited-scope action. The selected remedy is expected to comply with most chemical-, action-, and location-specific ARARs. Because of the environmental impacts of the sources not addressed in this ROD, EPA anticipates that the Old/No. 8 Mine Seep Operable Unit remedial action will not provide for compliance with all ARARs at all times, and consequently EPA is relying on the ARARs waiver for "interim measures" (40 C.F.R. §300.430(f)(1)(ii)(C)(1)) for remedy selection with respect to sources in the Old/No. 8 Mine Seep Operable Unit. The selected remedy does not address all sources of contaminant discharges at the site and cannot provide for compliance with the chemical-specific ARARs of the Central Valley Regional Water Quality Control Board's Basin Plan water quality objectives at all times or for full compliance with California Fish and Game Code Section 5650, which prohibits discharge of contaminants "deleterious to fish, plant life, or bird life." Accordingly, EPA is invoking the CERCLA Section 121(d)(4)(A) waiver for "interim measures" for these ARARs.

EPA has determined that the selected remedy is cost-effective pursuant to evaluations in accordance with Section 300.430(f)(1)(ii)(D) of the NCP. EPA has considered the quality of the data relied upon to characterize the site and the Old/No. 8 Mine Seep discharge. EPA has also considered the quality of the data relied upon during the development and evaluation of potential remedial alternatives, and the selection of the interim remedial action for the Old/Mine 8 Mine Seep.

EPA has determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized for the interim remedial action for the Old/No. 8 Mine Seep Operable Unit at the IMM site. Alternatives that might reduce or eliminate the AMD-forming reactions have been developed and evaluated in the Boulder Creek Operable Unit. EPA has concluded that significant additional development and evaluation of these approaches is required, and this conclusion also applies to the Old/No. 8 Mine Seep Operable Unit. EPA encourages the continued development of those alternatives that could reduce or eliminate the AMD-forming reactions for consideration in a subsequent action for the IMM site. Treatment of the discharges will effectively eliminate the contaminant discharges and is a component of all alternatives developed to date. Treatment, therefore, is consistent with any anticipated subsequent actions.

Because this action does not constitute the final remedy for the IMM site, the statutory preference for remedies employing treatment that reduces toxicity, mobility, or volume as a principal element will be further addressed by the final response action. Subsequent actions are planned to fully address the threats posed by the conditions at this site. Because this remedy will result in hazardous substances remaining onsite above health-based levels, a review will be conducted to ensure that the remedy continues to provide adequate protection of human health and the environment within 5 years after commencement of the remedial action. Because this is an interim action ROD, review of this site and of this remedy will be ongoing as EPA continues to develop final remedial alternatives for the site.

  
John Wise  
Acting Regional Administrator

9-24-93  
Date

# **RECORD OF DECISION IRON MOUNTAIN MINE SHASTA COUNTY, CALIFORNIA**

## **THE DECISION SUMMARY**

### **I. SITE NAME, LOCATION, AND DESCRIPTION**

#### **I.1 Site Name**

Iron Mountain is located in Shasta County, California, approximately 9 miles northwest of the City of Redding, see Figure 1. The collection of mines on Iron Mountain is known today as Iron Mountain Mines. They are the southernmost mines in the West Shasta Mining District. The District encompasses over a dozen sulfide mines that have been worked for silver, gold, copper, zinc, and pyrite.

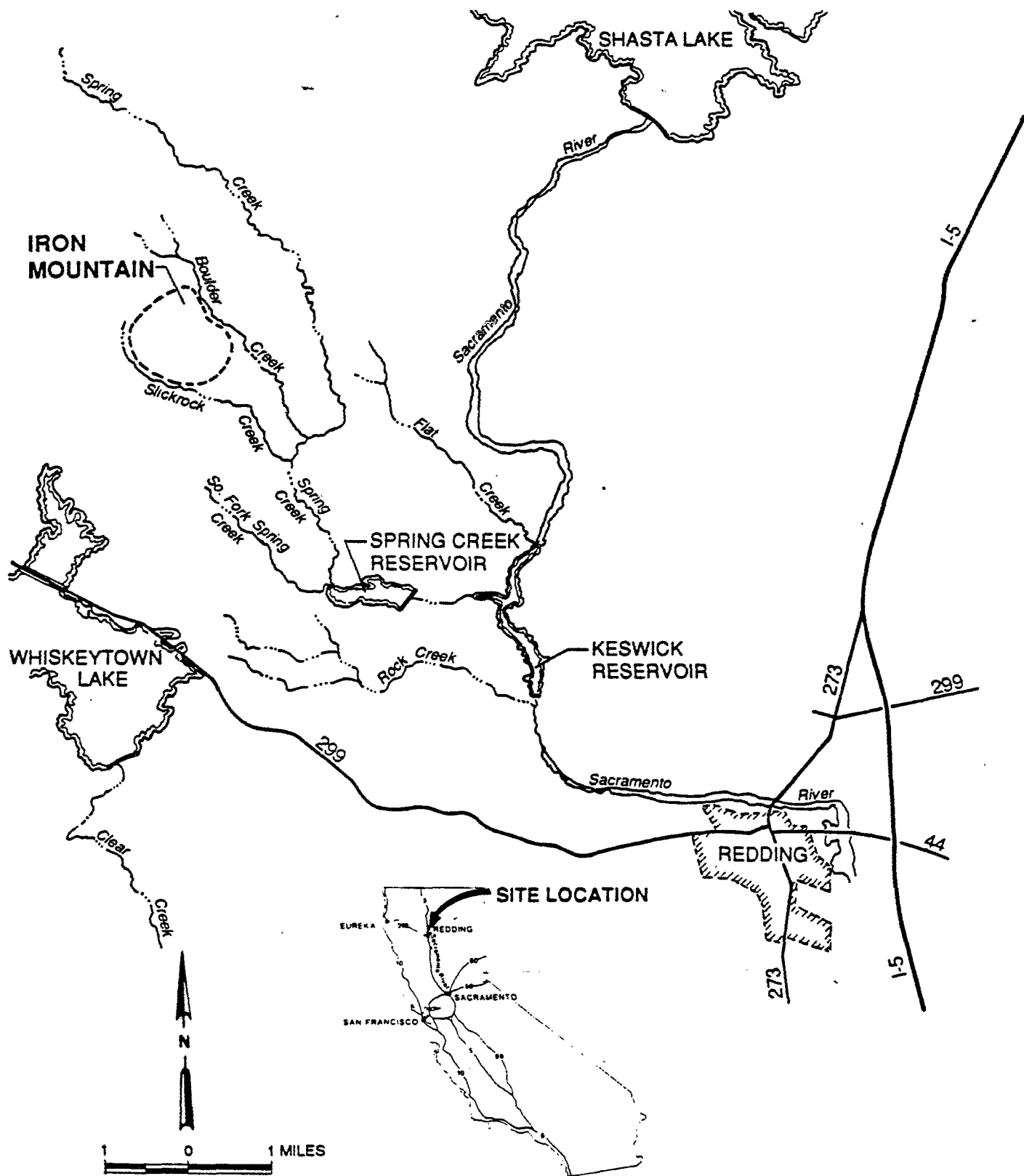
#### **I.2 Site Location**

The Iron Mountain Mine Superfund site is defined pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) to include the inactive mines on Iron Mountain and areas where hazardous substances released from the mines are now located. The Iron Mountain Mine (IMM) site includes approximately 4,400 acres of land that includes the mining property on the topographic feature known as Iron Mountain, the several inactive underground and open pit mines, numerous waste piles, abandoned mining facilities, mine drainage treatment facilities, and the downstream reaches of Boulder Creek, Slickrock Creek, Spring Creek, Spring Creek Reservoir, Keswick Reservoir, and the Sacramento River affected by drainage from Iron Mountain Mine.

#### **I.3 Site Description**

The summit of Iron Mountain is 3,583 feet above mean sea level and is approximately 3,000 feet above the Sacramento River, 3 miles to the east. The terrain is very steep, with slopes dropping 1 to 2 feet for every 2 feet horizontally, or steeper. The mountain is predominantly forested with some areas of brush, and there are numerous unpaved roads leading to various work locations.

Several, and possibly all, of the mines and the waste rock piles are discharging acidic waters, typically with a high content of heavy metals. These discharges are herein referred to collectively as acid mine drainage, or AMD. The largest sources of AMD are located within the Iron Mountain Mine property. The largest source of AMD is the Richmond Mine, and the second largest is the Hornet Mine, both of which drain into Boulder Creek. The third largest source and the subject of this ROD is the Old/No. 8 Mine Seep, which drains into Slickrock Creek. Old/No. 8 Mine Seep is



**FIGURE 1**  
**LOCATION OF**  
**IRON MOUNTAIN SITE**  
 IRON MOUNTAIN MINE OLD/NO. 8 MINE SEEP ROD

located on the south side of Iron Mountain at an elevation of approximately 2,500 feet. The seep is located on the north slope of the Slickrock Creek valley proximate and below the landslide-covered portals of Old Mine and No. 8 Mine. The portals were covered when a large mass of overburden soils and waste rock (largely from the Brick Flat Pit open pit mining) slid into Slickrock Valley in 1955. The frequent small slides are continuing to add to the landslide cover. The present condition of the tunnels and stopes of the Old Mine and No. 8 Mine is unknown, but the available reports and literature indicate that some of the mine openings were backfilled with sludge and waste rock during mine operations. From observations of other underground mines at this site, it is reasonable to assume that some of the unfilled mine openings have collapsed. The proportion of drainage from the two mines is unknown.

EPA has identified control of the AMD sources in the Slickrock Creek drainage basin as a major step in the ultimate control of the contaminant discharges from Iron Mountain. EPA has designated the Old/No. 8 Mine Seep as an Operable Unit for a feasibility study of pollution sources and alternative approaches for AMD control.

The IMM site contains a very large mass of nearly pure sulfide (massive deposit), several small massive sulfide deposits, several zones of disseminated sulfides, and a large gossan. The gossan is a zone of rock from which disseminated sulfides have been almost completely removed by natural solution, leaving a residue of iron and other metals. The gossan has been mined by open pit for residual metals. The disseminated and massive sulfides have been mined in open pit and underground openings for copper, cadmium, zinc, and pyrite. The main country rock at the IMM site is rhyolite.

Commercial mining at the IMM site started in 1879 and continued, with a few interruptions, until 1963. In the early twentieth century, the site was one of the largest copper mines in the United States. Mineral extraction objectives and methods varied widely. In recent years, metal recovery activity at the site has been limited to extracting copper from the AMD, using copper cementation and occasional sales of previously mined material (such as hematite tailings).

#### **I.4 Adjacent Land Uses**

The adjacent land is largely undeveloped wilderness property that is currently infrequently visited because of the rugged topography and few roads. Off-road vehicles have been known to visit these areas, and the U.S. Bureau of Land Management has notified EPA with regard to potential acquisition of adjacent lands for preservation as wilderness and enhancement for recreational use.

#### **I.5 Natural Resources Uses**

The natural resources on the mining property and in the surface waters which flow on or adjacent to the mining property at one time included mature stands of timber, fish, other aquatic populations, and sulfide minerals. The natural resources in the down-gradient Sacramento River include the valuable Sacramento River fishery, recreational use of the river and Keswick Reservoir, and the valuable water resources, which are a

major component of the U.S. Bureau of Reclamation's (USBR's) water distribution system for the State of California.

The timber on the IMM site has been largely removed for the mine operations or sale. The timber stands were also extensively damaged by historic smelter operations in the early 1900s. The portions of Boulder Creek, Slickrock Creek, and Spring Creek impacted by AMD from IMM are essentially lifeless. A major portion of the sulfide minerals remain in the mines and in undeveloped areas. The market for sulfide minerals has not been attractive in recent years, and there is no verified proposal to mine these deposits in the near future.

Spring Creek Reservoir was constructed in part as a mitigation measure for the AMD discharges and does not support aquatic life. It is not used for any recreational purpose.

The portion of Keswick Reservoir impacted by Iron Mountain Mine AMD has reduced recreational value. The resident trout fishery is impacted by the heavy metal contaminants in the water column of the mixing zones and the heavy sediment loadings caused by the precipitation of iron and co-precipitation of heavy metals.

The upper Sacramento River salmon fishery is the most important fishery in the State. The salmon fishery has experienced large population declines over the past 20 years because of a number of factors, including Iron Mountain Mine AMD impacts. The Sacramento River also supports a major steelhead trout and resident trout fishery.

The water resources held in Shasta Lake by the USBR as part of its Central Valley Project (CVP) are an important component of the water distribution system for a growing California's municipal and agricultural interests. CVP operations are today sometimes constrained by the Iron Mountain Mine AMD discharges in order that water quality conditions in the Sacramento River can be maintained within safe bounds for fishery protection. On occasion, USBR has released water from Shasta to dilute AMD, water which would otherwise have been used for beneficial purposes.

#### **I.6 Location and Distance of Human Populations**

Iron Mountain Mine is mainly remote from human populations because of the rugged terrain and the single-access roadway. The mine owner has provided heavy metal gates, which are locked at most times to discourage casual entry to the site. Human contact with the flows from Iron Mountain is mainly limited to the waters downstream of Spring Creek Debris Dam, which include Keswick Reservoir and the Sacramento River below Keswick Dam.

The closest community is Keswick, located just east of the site. Several isolated residences are between Keswick and the mine property. The City of Redding has a population of approximately 70,000 people and is located approximately 9 miles from the site.

## **I.7 General Surface-Water and Groundwater Resources**

Local surface drainage includes Boulder Creek, located northeast of the mountain, and Slickrock Creek, located to the southwest. Boulder Creek and Slickrock Creek flow into Spring Creek. Spring Creek flows south and east to the Spring Creek Debris Dam (SCDD), from which the USBR releases flow into the Sacramento River. Flat Creek drains an area to the east of Iron Mountain and enters the Sacramento River approximately 0.8 mile north of Spring Creek. Flat Creek also receives water from Upper Spring Creek, as a result of a water diversion project constructed in 1990 as part of the CERCLA response at Iron Mountain.

Old/No. 8 Mine Seep consists of several apparently separate discharges in an area of about 130 square feet. The AMD discharging from the seep flows downhill and is collected in an unlined basin about 12 feet long, 10 feet wide, and 2 feet deep. The basin was constructed to measure flows from the seep. The AMD flows from the basin to a copper cementation plant in a 140-foot-long stainless steel flume.

Slickrock Creek drains the south side of Iron Mountain and flows generally from the northwest to the southeast. The headwaters of Slickrock Creek are at about Elevation 3200 feet. The creek flows about 3 miles to its confluence with Spring Creek at Elevation 1350. The stream carries water from several small ephemeral tributaries as well as discharges from Old/No. 8 Mine Seep and Big Seep, 200 to 300 feet upstream. Slickrock Creek also receives drainage from Brick Flat Pit. The average daily flow of Slickrock Creek at its confluence with Spring Creek is 9.4 cubic feet per second (4,200 gpm).

The rainfall-runoff responsiveness of the Old/No. 8 Mine Seep Operable Unit may vary significantly throughout storm events. The amount of runoff is dependent on antecedent moisture conditions, storm intensity, the vegetative cover, ground slope, length of distributing area, and geology. Major storm events may cause a rapid rise in water levels in the creek.

The rhyolite country rock is a dense rock with two to three sets of joints and a number of faults. The rock blocks generally lack significant porosity, and the low porosity of the rock mass is due to the joint/fault discontinuities. The presence of groundwater and its movement within the rock are largely controlled by the discontinuities.

The massive sulfide deposits were largely isolated from the groundwater before mining because the joints generally do not extend from the country rock into the mineralized zone. Groundwater was present in the disseminated zones. Mine openings and cracking caused by ground movements induced by mining have opened large volumes of massive sulfide to groundwater and have increased groundwater access to the disseminated sulfide mineralization. The additional groundwater movement and increased circulation of air within the rock mass has greatly accelerated the process of sulfide dissolution and the formation of metal-rich acid mine drainage.

Surface water and groundwater at Iron Mountain were previously used for mining operations and to provide water supply to the mine staff and their families. These

resources are essentially unused today because the mines are inactive and surface waters are being contaminated by AMD.

### **I.8 Surface and Subsurface Features**

An open pit mine at Brick Flat, underground workings at Old Mine, No. 8 Mine, the Confidence-Complex Mine on the southern flank of the mountain, and the Richmond and Hornet Mines on the northern flank are the large mines on Iron Mountain.

Four sulfide ore bodies were mined in the Slickrock Creek drainage. They are Old Mine, No. 8 Mine, Confidence Mine, and Oskosh Mine. The Oskosh is a small mine on the south side of the Slickrock Creek valley at a relatively low level, and the Confidence Mine is high on the north side of the valley. Both mines appear to discharge small to moderate volumes of AMD or secondary quantities of metal. The Old Mine and No. 8 Mine appear to have had more significant mining operations and to be more significant sources of AMD.

Old Mine was developed to mine portions of a gossan deposit which could not be reached by quarrying. The mine is under the north slope of Slickrock Creek valley with the mine workings ranging from the elevation of the lower slope to well below the elevation of the adjacent reach of Slickrock Creek. A method of underground mining called slice stoping was used. The ore was removed in 7-foot-high layers working from the bottom toward the top of the deposit. A working surface was maintained by progressively backfilling the mined opening with rock rubble returned to the mine through dropholes from the ground surface. The extent of the backfilling is not clear from the records available to EPA, but the volume of remaining voids in the mine at the time of closure may have been small compared with adjacent mines on the IMM site.

The ore deposit of the No. 8 Mine is at the level of the middle of the north slope of Slickrock Creek valley. The intervening 300 feet of rock has little or no sulfide mineralization. The ore is a mass of rock with disseminated chalcopyrite mineralization in veins as contrasted with the massive sulfide or massive disseminated ore bodies of the other mines on the IMM site. The mine consists of three levels of tunnels and small to moderate size openings which follow the veins. The mine is as high as Elevation 2400, but portions are below the elevation of Slickrock Creek. Mining started in 1907 and ended after World War II. Portions of the mine are reported to have been backfilled with waste rock or tailings slime.

The Brick Flat open pit mine was operated between 1929 and 1942 and from 1955 to 1962. Most of the overburden and waste rock was placed in a large waste pile south of the pit and above the north slope of Slickrock Creek valley. In 1955, a large landslide of these materials moved into the Slickrock Creek valley, covered the Old Mine and No. 8 Mine portals, and filled the valley bottom to a depth of 80 feet. A comparison of old and recent topographic maps indicates that the present bed of Slickrock Creek is about 40 feet south of the bed prior to the large slide. The slide surface is presently almost devoid of vegetation, suggesting continued sliding.

## **II. SITE HISTORY AND ENFORCEMENT ACTIVITIES**

### **II.1 History of Site Activities that Led to Current Problem**

Iron Mountain Mine was first secured for mining purposes in 1865 and various individuals held the property and conducted limited mining for the recovery of silver from the gossan cap in the late 1800s. The waste-generating activities that created the surface sources of AMD likely began in the 1880s when the gossan was first mined on a large scale, and waste rock that was removed to reach the ore was apparently dumped into ravines and eventually washed into the creeks.

Beginning in late 1894, Mountain Mining Co., Ltd., began operation of the mine. In approximately 1896, Mountain Copper Co., Ltd., assumed ownership of the mine. Under Mountain Copper, Ltd.'s, operation of the mines, Iron Mountain became the largest producer of copper in California and the sixth largest producer in the country during the first quarter of the twentieth century. The high-grade copper ore in Old Mine was mined until 1907, No. 8 mine from 1907 until as late as 1923, Hornet Mine from 1907 to 1926, the Richmond Mine from 1926 through 1956, and Brick Flat Pit from 1929 to 1942 and 1955 to 1962.

In 1968, Stauffer Chemical Co. acquired Mountain Copper Co., Ltd., and thereby acquired beneficial ownership of the Iron Mountain Mine. Stauffer transferred record of ownership of most of the parcels comprising Iron Mountain Mine from its wholly owned subsidiary to itself in 1969. Stauffer operated the copper cementation plant during its ownership of the site and continued to investigate the commercial mining potential of the property. In November 1976, the California Regional Water Quality Control Board issued Stauffer an order requiring the abatement of the continuing pollution from the mountain.

In December 1976, Stauffer transferred ownership of 31 parcels on Iron Mountain to Iron Mountain Mines, Inc., (IMMI), and in December 1980, 5 additional parcels were transferred to IMMI. IMMI, a California corporation, is the current owner of Iron Mountain. IMMI constructed a copper cementation plant on Slickrock Creek in 1977. IMMI has intermittently operated this plant and the copper cementation plant on Boulder Creek to recover copper from the AMD.

### **II.2 Impacts of Mining Activity at Iron Mountain**

Mountain Copper employed stoping, block caving, and room-and-pillar techniques in the underground mines; side-hill and open-pit techniques were used at the ground surface. These mining activities and subsequent collapse of some of the underground mine workings have fractured the bedrock overlying the mine. The sulfides in the fractured bedrock above the mine and the sulfides remaining in the mine are, in the post-mining period, more exposed to water, air, and bacterial action. The potential for acid drainage and metals contamination is greater than prior to mining and may have increased since the mining ceased in response to deterioration of the ground over the abandoned mines.

The mined openings and the ground affected by mining activity now function as effective groundwater drains, drawing groundwater and unsaturated percolation to and through the sulfide mineralization. The sulfides that were once largely below the water table are now largely within the unsaturated zone, and oxygen is available for reaction. The exothermic oxidation of the sulfide elevates the overall temperature in the sulfide mineralized zone, induces convective airflow, and likely induces evaporation of some subsurface mine waters. These processes contribute to the intensity and pattern of acidic discharges.

These mining-related characteristics, in combination with the natural occurrence at Iron Mountain of nearly pure massive sulfide deposits surrounded by bedrock with very little neutralizing capacity, result in a unique hydrogeochemical reactor that is nearly optimal for maximum production of acid mine waters (Nordstrom and Alpers, 1990). Iron Mountain produces mine waters that are among the most acidic in the world, containing extremely elevated concentrations of copper, cadmium, zinc, and other metals known to be toxic to aquatic life.

### **II.3 Central Valley Project Related Impacts**

The use of Sacramento River water to serve a growing California has also increased the significance of Iron Mountain AMD impacts in the Sacramento River. The USBR constructed Shasta Dam in 1943 to control Sacramento River flows; Keswick Dam, located downstream of Shasta Dam, was completed in 1950. Spring Creek and Sacramento River flows mix in the lower third of Keswick Reservoir. Prior to the USBR's construction of these dams on the Sacramento River, the AMD was often diluted by large flows of water from farther upstream on the Sacramento River.

Although fish kills and toxicity problems were documented prior to the completion of Shasta Dam in 1943, the dam compounded the toxicity problems by reducing the availability of dilution flows (Central Valley Regional Water Quality Control Board, 1976; Wilson, 1977; Finlayson and Wilson, 1989).

Keswick Dam and Reservoir were completed in 1950. This dam restricted the salmon and steelhead to spawning grounds in downstream areas. This restricted the naturally spawning salmon and their early life stages to that area of the Sacramento River with the greatest exposure to AMD discharges from Iron Mountain.

After construction of Keswick Dam in 1950, the sediment load from Spring Creek, which previously had been wasted downstream, caused a delta to form in the Spring Creek arm of Keswick Reservoir.

In response to the problems at Spring Creek, the USBR constructed SCDD in 1963 to help control the toxic releases from Spring Creek and to prevent sediment from forming a delta in the vicinity of the Spring Creek Powerplant tailrace.

The SCDD allows for the storage and controlled release of water from the Spring Creek basin. Optimally, releases from Spring Creek Reservoir are timed to coincide with releases from Shasta Reservoir to meet interim water quality criteria in the

Sacramento River. However, because of the relatively limited capacity of Spring Creek Reservoir with respect to peak discharges from the Spring Creek watershed, there have been uncontrolled spills from the reservoir. Although the debris dam has helped to reduce the incidence and severity of major fish kills, it has not eliminated them. In addition, the gradual release of Iron Mountain AMD from SCDD increases the duration of exposure of fish in the Sacramento River to chronic toxicity resulting from Iron Mountain AMD (U.S. EPA, 1992b).

#### **II.4 History of Federal and State Site Investigations**

Remedial investigation (RI) activities at Iron Mountain began in September 1983, when Iron Mountain was placed on the National Priorities List of the nation's most contaminated sites. In conjunction with EPA's Record of Decision for the first operable unit at Iron Mountain, EPA issued an RI report in 1985 (U.S. EPA, 1985a). That report characterizes the entire Iron Mountain site with respect to the nature and extent of contamination from information available at that time. Site characterization studies have continued within the Boulder Creek watershed, and EPA has prepared a second RI report (U.S. EPA, 1992a) to present information developed in these additional studies. An Endangerment Assessment (EA) has been prepared to characterize and evaluate the current and potential threats to the environment that may be posed by Iron Mountain contaminants migrating to the groundwater, surface water, and air (U.S. EPA, 1992b), and EPA's public health risk assessment (U.S. EPA, 1991) has been updated. The RI/FS for the Old/No. 8 Mine Seep Operable Unit was completed in December 1992.

The first ROD for the IMM site was signed in October 1986 and addressed limited source control and water management actions in an interim remedy. The Boulder Creek OU ROD, signed in September 1992, addresses remedial actions for (1) AMD from the Richmond and Lawson portals, the two largest sources of acidity and metals contamination at Iron Mountain; and (2) the numerous waste rock piles, tailing piles, seeps, and contaminated sediments that also affect contaminant levels in Boulder Creek. The Old/No. 8 Mine Seep OU addresses the third largest source at IMM.

EPA has coordinated its site investigation and evaluation activities with those of Zeneca, Inc., (Zeneca) in a cooperative RI/FS process. (Zeneca was formerly named ICI Americas, Inc.) Zeneca represents Rhone-Poulenc Basic Chemicals Co. (formerly named Stauffer Chemical Co.). Zeneca has performed investigation activities at the site, predominantly related to the Boulder Creek OUFs.

#### **II.5 History of CERCLA Enforcement Activities and Remedial Action**

EPA's Superfund program became involved with the Iron Mountain pollution problem shortly after the enactment of the Superfund law in December 1980. On April 5, 1982, EPA issued general notices of liability to Stauffer Chemical Co. and IMMI for the past and continuing releases of hazardous substances from Iron Mountain and the resulting damage to and destruction of natural resources.

The Iron Mountain Mine site was listed on the National Priorities List in 1983. From 1983 through 1985, EPA conducted an RI/FS of the site and published its report in 1985. After public comment and publication of a Feasibility Study Addendum, EPA signed the first Iron Mountain Mine Record of Decision in October 1986. That ROD selected a partial remedy at the site, identifying a number of specific projects. These projects included the construction of a partial cap over the Richmond mineralized zone, including a cap of Brick Flat Pit; construction of a diversion in Slickrock Creek to avoid an AMD-generating slide; construction of a diversion of the Upper Spring Creek to avoid polluting its cleaner water and filling Spring Creek Reservoir; construction of a diversion of the South Fork of Spring Creek for a similar purpose; a study of the feasibility of filling mine passages with Low-Density Cellular Concrete; and an enlargement of Spring Creek Debris Dam, the exact size of which would be determined after implementation of other remedies.

During 1987 and 1988, EPA sued the property owner to gain access to the site for the purpose of constructing the first of these actions. The court granted EPA access and ordered the property owner not to interfere with the remedial actions.

On July 19, 1988, EPA initiated construction of the partial cap over the Richmond mineralized zone. As part of that construction, EPA used tailings materials from the Minnesota Flat area, as well as selected other tailings piles that contained relatively high concentrations of copper, cadmium, and zinc. EPA completed construction of the partial cap in July 1989.

EPA, through the USBR, began construction of the Slickrock Creek diversion in July 1989 and completed construction in January 1990.

Under an EPA Order, ICIA (now known as Zeneca), on behalf of Stauffer Chemical Company/Rhone-Poulenc Basic Chemicals Co., began construction of the upper Spring Creek diversion in July 1990. Construction was substantially completed in December 1990.

In addition to the activities implemented pursuant to the ROD, EPA recognized the need for additional actions in light of the drought conditions prevailing in California during the late 1980s. In the winter of 1988 through 1989, EPA operated an emergency treatment plant at the site to reduce the toxicity of the AMD releases.

The following fall, the winter-run chinook salmon was listed as a threatened species under the Endangered Species Act. In August 1989, in part due to the continuing drought conditions, EPA issued an order requiring that potentially responsible parties (PRPs) operate an emergency treatment plant at the site to reduce the toxicity of the AMD discharges for the upcoming 1989 through 1990 winter wet season and to provide for metals removal for future years until such time as remedial actions could be selected and implemented. This plant was to be comparable in scope and operation to the plant operated by EPA the previous winter. Pursuant to that order, Zeneca, on behalf of Rhone-Poulenc Basic Chemicals, constructed the treatment plant and has operated this treatment plant during the 1989 to 1990, 1990 to 1991, and 1991 to 1992 wet seasons. Because of the continuing drought in California and the critical fishery

conditions, EPA issued an order on September 2, 1992, for the 1992 to 1993 wet season requiring that additional emergency measures be implemented, including increasing capacity of the treatment plant.

EPA has also issued an order requiring the PRPs to operate and maintain all EPA-constructed remedial actions as well as the actions taken by the PRPs under other orders.

EPA has identified the following persons as potentially responsible parties, parties who may be liable pursuant to CERCLA, for the cleanup of the site: the former owner and operator, Rhone-Poulenc Basic Chemicals (the successor to Mountain Copper, Ltd. and Stauffer Chemical Company), and the current owner and operator, Iron Mountain Mines, Inc., and its president and primary owner, T. W. Arman.

EPA and the State of California have brought a civil suit under CERCLA §107 against the potentially responsible parties to obtain reimbursement for government funds spent in responding to the threat at IMM. The district court has held that the cost recovery authorities of CERCLA do not allow actions against parties for response to mining wastes and has dismissed the governments' action against Rhone-Poulenc Basic Chemicals. EPA plans to appeal that ruling.

Subsequent to the ruling under CERCLA, EPA issued an amended order to the responsible parties under the authority of RCRA §7003, and the State of California issued an order under the Health and Safety Code requiring the responsible parties to continue with implementation of response actions, including construction of the treatment plant selected in the September 1992 ROD. Rhone-Poulenc has agreed to construct the simple mix peak plant and other portions of the selected remedy, and has agreed to operate the emergency treatment plant under the same conditions as last winter until the larger plant is on-line. The State of California has also filed an action in Superior Court against the responsible parties.

### **III. HIGHLIGHTS OF COMMUNITY PARTICIPATION**

EPA issued its first Record of Decision for the Iron Mountain Mine site in October 1986. EPA has issued factsheets regarding that decision and commencement of remedial design (July 1987), commencement of remedial action (July 1988), implementation of emergency response treatment actions (February 1989), and the performance of a demonstration program under EPA's Superfund Innovative Technology Evaluation (SITE) program (August 1991). EPA also updated its Community Relations Plan, which was finalized in May 1990.

EPA has regularly provided information to the local television news and the press regarding the ongoing study and cleanup actions, and this has resulted in significant local media coverage. Although the community has maintained interest in the progress of cleanup at the site, community involvement had been moderate until the winter wet seasons of 1991 to 1992. Due to the drought conditions facing California and the occurrence of a March 1992 storm which required the special release of 95,000 acre-feet of valuable water resources from Shasta Lake, community interest and involvement

in the IMM site, including Old/No. 8 Mine Seep Operable Unit Feasibility Study and Proposed Plan, was significant. Federal, state, and county officials expressed interest and concern regarding cleanup progress and remedy selection.

EPA issued the Boulder Creek RI, FS, Environmental Endangerment Assessment, an updated public health Risk Assessment, Administrative Record, and the Boulder Creek Operable Unit Proposed Plan for public review on May 20, 1992. To fulfill the requirements of CERCLA Section 113(k)(2)(B)(i-v) and Section 117, EPA made these documents available to the public both at the EPA Records Center in San Francisco, California, and at the official information repository at the Shasta County Library in Redding, California. EPA also made the above documents and the large majority of the Administrative Record available to the public at the Meriam Library of the California State University at Chico, California. A public comment period was held. In addition, a public meeting attended by 200 people was held in Redding, California, at the Red Lion Hotel on June 11, 1992. At this meeting, representatives from EPA, the California Regional Water Quality Control Board, Department of Toxic Substances Control, and Department of Fish and Game made presentations regarding the remedial alternatives under consideration. EPA answered questions regarding the remedial alternatives under consideration and problems at the site. EPA received 19 formal oral comments at the meeting.

EPA received approximately 100 comment letters from the public during the public comment period. EPA responded to these comments in a Responsiveness Summary, which is part of the Record of Decision for the Boulder Creek OU, the second ROD for the IMM site.

EPA issued the Old/No. 8 Mine Seep RI/FS, the Administrative Record, and the Old/No. 8 Mine Seep Operable Unit Proposed Plan for public review on February 11, 1993. To fulfill the requirements of CERCLA Sections 113(k)(2)(B)(i-v) and 117, EPA made these documents available to the public both at the EPA Records Center in San Francisco, California, and at the official information repository at the Shasta County Library in Redding, California. EPA also made the above documents and the Administrative Record available to the public at the Meriam Library of the California State University at Chico, California. The notice of availability of these documents was published in the Redding *Record Searchlight* on February 11, 1993. A public comment period was held from February 11, 1993 through April 15, 1993. In addition, a public meeting attended by 100 people was held in Redding, California, at the Red Lion Hotel on February 25, 1993. At this meeting, representatives from EPA made presentations regarding the remedial alternatives under consideration. EPA answered questions regarding the remedial alternatives under consideration and problems at the site. EPA received three formal oral comments at the meeting.

EPA received comment letters from the public during the public comment period. EPA responded to these comments in a Responsiveness Summary, which is part of the Record of Decision for Old/No. 8 Mine Seep OU.

EPA has received an application for a Technical Assistance Grant (TAG) from the Shasta Natural Science Association, which is associated with the Carter House Natural

Science Museum in Redding, California. The purpose of the TAG is to help interpret for the layperson the scientific and engineering information developed as a part of the Iron Mountain Mine Superfund cleanup action. The original application was received in January 1992. The application was revised and resubmitted on July 22, 1993. EPA expects to issue a decision on this grant in September 1993. If approved, the TAG will provide \$48,875, with the Shasta Natural Science Association contributing up to \$29,900 in matching funds.

#### **IV. SCOPE AND ROLE OF THE OPERABLE UNIT WITHIN SITE STRATEGY**

##### **IV.1 Role of the Remedial Action**

In accordance with the program management principles identified in the NCP and 40 C.F.R. §300.430(a)(1)(ii)(A) and (B), EPA has designated the Old/No. 8 Mine Seep as an operable unit.

EPA has determined, in conference with the California support agencies, that this designation of the Old/No. 8 Mine Seep Operable Unit will allow the EPA to focus its RI/FS efforts on this large and complex Superfund site to more quickly achieve a significant risk reduction and ultimately expedite the total site cleanup. To achieve the greatest risk reduction in an expeditious manner, however, it has been necessary to focus the FS further to take into account the following observations:

- The Old/No. 8 Mine Seep AMD discharges have been identified by EPA's RI efforts as the third largest source of metal contamination on Iron Mountain. The seep discharges an estimated 30 percent of the copper and 3 percent of the cadmium and zinc discharged from IMM. Remediation of this source would provide an immediate significant reduction in acid water and heavy metals loading to the environment.
- The Old/No. 8 Mine Seep is drainage from at least one and probably both of these mines. The portals of the two mines were covered by a landslide in 1955 and are inaccessible. A part of the drainage may come from landslide deposits adjacent to or above the mine portals.
- Results from implementation of remedial actions for sources in the Old/No. 8 Mine Seep Operable Unit will be important considerations in setting remedial action objectives for an overall final site remedy. If, as expected, water management capabilities remain a component of the final site cleanup plan, the degree of success in halting or reducing the AMD discharge will affect the ultimate design and cost of the water management system.

##### **IV.2 Scope of the Problem Addressed by the Remedial Action Selected**

The Old/No. 8 Mine Seep OUFS considers remedial alternatives for the largest sources of acidity and metals contamination in the Slickrock Creek drainage. Because this FS represents only an interim remedy for a portion of the site, consideration of

alternatives for this source takes into account the need to be consistent with future remedial action and the need to reduce significant risks as soon as possible.

EPA expects to require an additional study of the sources in the Slickrock Creek drainage; sediments in Slickrock Creek, Spring Creek, Spring Creek Reservoir, Keswick Reservoir, and the Sacramento River; and other impacted areas and sources of contamination. The additional study will also assess potential water management options, including the need to coordinate releases of acidic waters with Central Valley Project water releases. EPA is currently developing a work plan for this additional RI/FS activity.

## V. SITE CHARACTERISTICS

### V.1 Contamination

The AMD discharges from the Old/No. 8 Mine Seep at the base of the large debris slide at IMM. This AMD is attributed to sources within the Old Mine and No. 8 Mine on the Slickrock Creek side of Iron Mountain because of its character and pattern of discharge. These workings are, however, inaccessible due to the thick cover of debris which has slid over these workings. The debris is sidecast materials from the operation of the Brick Flat Pit open pit mine. AMD flows year-round from the Old/No. 8 Mine Seep. This flow has been monitored for flow rate and water quality on a regular basis since 1978, as shown in Table 1. Flow from Old/No. 8 Mine Seep does not show sharp peaks, although the flow rate will increase following a large winter storm. The estimated average annual flow for Old/No. 8 Mine Seep is 59 gpm. The pH is commonly between 2 and 3.

Table 1 Summary of Water Quality and Flow Data for Old/No. 8 Mine Seep, 1978 to 1990				
	No. of Samples	Mean <sup>a</sup>	Minimum	Maximum
Flow (gpm)	278	59	15	231
pH	218	2.58	1.15	3.5
Copper, total (mg/l)	286	133	59	250
Zinc, total (mg/l)	283	55	19.3	140
Cadmium, total (mg/l)	282	0.49	0.20	1.17
<sup>a</sup> Mean average calculated as sum of samples divided by number of samples.				

### V.2 Location of Contamination and Known or Potential Migration Routes

As discussed above, analytical data collected over 40 years indicate that Iron Mountain is releasing large quantities of contaminants to the environment (primarily surface water) via AMD discharges. The AMD is characterized by low pH (1 to 3) and very high concentrations of heavy metals.

The water quality parameters of concern from a public health exposure perspective are pH, cadmium, copper, and zinc. These parameters are selected because of potential dermal contact effects caused by low pH and potential consumption of AMD (with these three metals being of greatest concern from a water consumption perspective).

The contaminants of concern from the perspective of fisheries (salmon and steelhead trout) exposure are pH, cadmium, zinc, copper, and aluminum. These parameters are selected because of their toxicity, primarily to salmonids, at low pH levels and concentrations ranging from 1  $\mu\text{g/l}$  for cadmium to 100  $\mu\text{g/l}$  for aluminum (copper toxicity levels are in the range of 10  $\mu\text{g/l}$ , and zinc toxicity levels are in the range of 50  $\mu\text{g/l}$ ). For comparison, 1  $\mu\text{g/l}$  equals 0.001 mg/l.

The contaminants of concern with respect to terrestrial wildlife include arsenic as well as those listed above for aquatic species.

The major mechanism for onsite and offsite transport of contaminants is surface water. The AMD enters Boulder and Slickrock Creeks, and these two creeks discharge into Spring Creek, which flows to the Sacramento River at Keswick Reservoir.

The major processes that appear to affect the fate of transported copper, cadmium, and zinc are coprecipitation with iron hydroxides or precipitation as carbonates. Metals concentrations are further reduced and surface-water pH is raised by dilution as Spring Creek discharges into the main body of Keswick Reservoir (Figure 1).

AMD from the Old/No. 8 Mine Seep is physically transported by a short open-topped flume to a copper cementation plant located near the seep in Slickrock Creek valley. The flume has, at times, overflowed and leaked at joints, which acidifies the receiving soil and deposits highly concentrated metal salts into the terrestrial wildlife habitats. The degree of consumption of these salts by deer and other animals is not presently known.

The contaminants of concern can be biologically transported through the aquatic food chain. For example, the initial uptake of contaminants would be by phytoplankton, periphyton, and other aquatic vegetation. These food sources would be ingested by benthic invertebrates and/or zooplankton. The plankton and benthos would be ingested by fish at subsequently higher trophic levels and ultimately consumed by birds, animals, and humans.

## **VI. SUMMARY OF SITE RISKS**

### **VI.1 General**

The Iron Mountain Mine Superfund site was placed on the National Priorities List on September 8, 1983. The site was listed because of the impacts of metals-laden AMD discharges on the Sacramento River, a major fishery and source of drinking water for the City of Redding and other domestic water supplies. The Iron Mountain site has been associated with water quality degradation and impacts on aquatic resources in nearby drainages during much of its history. Impacts include numerous fish kills in the upper Sacramento River (39 documented fish kills since 1940), the primary salmon-producing river in California (CDWR, 1985; CDFG, 1990). In addition, those portions of Boulder Creek, Slickrock Creek, and Spring Creek that receive AMD from Iron Mountain are essentially devoid of aquatic life.

The rationale for the Old/No. 8 Mine Seep Operable Unit is to address elevated metals loadings emanating from Slickrock Creek into Spring Creek and subsequently entering the Sacramento River. From the results of the RI, the Endangerment Assessment, and the ARARs analysis, two problem areas are identified for remedial action—human health risks and environmental risks.

## **VI.2 Human Health Risks**

The potential for direct human exposure to AMD is relatively small. The property owner has posted the property to discourage trespassers who might become exposed. The property is located between two heavily used national forests, however, and direct exposure cannot be ruled out as a possibility.

Persons who might come into direct contact or consume concentrated AMD at Iron Mountain could be at risk. Such persons include people working, living, or hiking at the site. Individuals who enter the Iron Mountain site are at risk if they have direct contact with or ingest the AMD. The risk of such exposure is limited by controlled access to the minesite.

Persons who might come into direct contact with surface water downstream from Iron Mountain include people working, living, hiking, or swimming near the site. Individuals who come in direct contact with water or sediments from the main body of Keswick Reservoir or Sacramento River are not currently at risk.

Persons who might consume surface water downstream from Iron Mountain include people working, living, or hiking near the site. Persons who might consume fish taken from the Sacramento River downstream from Iron Mountain include the general population in the upper Sacramento River Valley. Risks from fish consumption are of concern to the community. Individuals who consume fish from the main body of Keswick Reservoir or Sacramento River may currently be at some risk; however the uncertainties associated with this scenario are great and likely would result in the risk being overestimated. EPA will continue to assess such impacts in its continuing studies at the site.

Children are at somewhat greater risk than adults when considering noncancer toxicity resulting from incidental ingestion of creek water downstream from Iron Mountain.

## **VI.3 Environmental Risks**

The principal risks posed by the runoff of metals-bearing AMD from Iron Mountain are the associated impacts on aquatic life in the Spring Creek drainage, Keswick Reservoir, and the Sacramento River downstream of Keswick Dam. Among these natural resources, the most important are the fishery resources in the Sacramento River downstream of Keswick Dam. Migratory populations of chinook salmon, steelhead trout, resident trout, and numerous other aquatic and terrestrial species can be or are affected by AMD from Iron Mountain (U.S. EPA, 1992b).

The salmon and steelhead trout populations have high commercial and/or recreational value to the region (USFWS and USBR, 1984; USFWS and CDFG, 1987). The susceptibility of these populations to contaminants originating from Iron Mountain has been documented (Wilson, 1982). One of the chinook salmon runs, the winter run, is a species listed by the Federal Government as threatened with extinction and listed by the State of California as a species endangered with extinction.

Pollution from Iron Mountain is considered to be a major factor causing the decline in Sacramento River fishery resources, and an impediment to achieving fishery resource restoration goals. Other major factors contributing to the decline include loss of spawning habitat, predation, habitat degradation, mortality at dams and diversions, overfishing, and natural disasters (such as drought) (Vogel, 1989). Fish migrating into the uppermost river reach of the Sacramento River risk being killed by AMD from Iron Mountain; offspring of adult fish spawning in that reach have reduced chances of survival due to the Iron Mountain AMD (Finlayson and Wilson, 1979). There is an indication that AMD from Iron Mountain has reduced the suitability of available spawning grounds for salmon in the uppermost reaches of the Sacramento River and that fish population reductions have occurred following uncontrolled spillage of Iron Mountain AMD (Finlayson, 1979). The greatest decline in salmon-spawning populations has occurred within the uppermost river reach from Balls Ferry upstream to Redding, a distance of approximately 26 river miles (NOAA, 1989).

Since the late 1960s, when fish counts were initiated at Red Bluff Diversion Dam (RBDD), each of the anadromous salmonid runs has suffered major declines. A more extensive data base is available specifically for fall-run chinook. This data base demonstrates that recent levels of spawning escapement to the upper Sacramento River are only about 50 percent of levels observed during the late 1950s. The greatest decline among the salmon runs has occurred for the winter run, which has been reduced to less than 5 percent of run sizes during the late 1960s. This serious decline prompted the 1989 listing of this fish as a threatened species by the Federal Government (NMFS, 1989) and an endangered species by the State of California (CDFG, 1989).

The primary potential exposed fisheries populations are the salmonids and steelhead trout present in the Sacramento River; Boulder Creek, Slickrock Creek, and Spring Creek are devoid of fish and aquatic invertebrates below the mine drainage area. The upper Sacramento River chinook salmon runs, steelhead trout run, and resident populations of rainbow trout have life history characteristics that make them vulnerable to potential adverse effects from AMD originating from Iron Mountain. The probability and magnitude of potential exposure depends on the releases of contaminated water from SCDD, the releases of water from Shasta Dam, and the life stages present within the zone of impact.

For spring- and fall-run chinook salmon, in a worst-case scenario, approximately half of an entire year's fall spawning production could be at risk from contaminants released from Iron Mountain. The impact of the release depends in large part on the pattern of releases from Shasta Dam relative to when releases occur from IMM. For example, flood control releases from Shasta Dam could cause most of the year's production to

migrate downstream of the affected water quality zone, thereby reducing the AMD's impact.

Winter-run chinook salmon could be at higher risk compared to other runs. They are most likely to seek cooler water areas closest to Keswick Dam because of potentially lethal water temperatures in lower reaches of the Sacramento River. Under drought-type conditions, these fish are the most important to future runs because eggs laid farther downstream are more likely to be adversely affected by lethal warm water temperatures. However, these same drought conditions are more likely to create conditions (uncontrolled AMD release and low dilution in the Sacramento River) where AMD from Iron Mountain could pose a high risk to juvenile rearing in the uppermost reach of the river.

The steelhead trout and resident rainbow trout populations that are potentially at risk are not well-defined or understood. However, both the adult and yearling life phases are potentially at risk because both are present in the river when fish kills have historically occurred.

At present, a memorandum of understanding commits the USBR to operate SCDD in a manner that (when considering releases of dilution water from Shasta Dam) will protect aquatic life in the Sacramento River downstream of Keswick Dam. The USBR must also operate Shasta Dam to provide electric power, irrigation water, and flood control. The USBR estimated that during an average year it may lose between \$16 million and \$168 million, depending on the level of protection required in the Sacramento River, by supplying water to dilute Spring Creek flows. There is the potential that USBR's ability to supply adequate dilution water will be further reduced due to conflicting priorities for water use, thereby increasing the potential risk to the aquatic community.

It is extremely difficult to quantify fish mortality in the Sacramento River as a result of contamination from Iron Mountain Mine. This is due to a variety of factors, including the general size of the Sacramento River downstream of Keswick Reservoir and difficulty of visually observing dying or dead fish during periods when the water is turbid. However, there have been 39 documented fish kills near Redding since 1940, and there have been observations of adult steelhead mortalities near Redding attributable to metal contamination from Iron Mountain Mine since installation of the SCDD.

Boulder and Spring Creeks, downstream from Iron Mountain Mine discharges, do not support aquatic populations, and the creeks may remain sterile following remediation at Iron Mountain. Aquatic populations, water column and benthic, in Keswick Reservoir downstream of Spring Creek are at risk because of sediment contamination, as well as water column contamination. Below Keswick Dam, contaminant concentrations occasionally exceed toxic concentrations for sensitive life stages and frequently exceed both EPA and State of California criteria to protect aquatic life, indicating that these populations are also at risk.

Any terrestrial wildlife onsite has the potential for direct exposure to AMD, such as deer drinking from contaminated creeks or licking metals-laden salts along the flume

system, or consuming contaminated plants, fish, or other organisms. More than 300 species of amphibians, reptiles, birds, and mammals can be expected to occur in the Boulder Creek basin and downstream areas that may be directly exposed to AMD.

## **VII. DESCRIPTION OF ALTERNATIVES**

### **VII.1 General**

Pursuant to 40 CFR §300.430(e)(2)(i), in developing the remedial alternatives, the lead agency shall establish remedial action objectives. The NCP requires that the remedial action attain water quality criteria established under the Clean Water Act Sections 303 and 304 where relevant and appropriate under the circumstances of the release. The remedial action objective at the site is to eliminate IMM site discharges that are harmful to the environment. The contaminants of concern identified in the 1986 ROD (U.S. EPA, 1986c) are acidity and toxic metals, which include copper, cadmium, and zinc. All of these are present in AMD from Old/No. 8 Mine Seep.

### **VII.2 Screening Evaluation**

In general, there are two principal steps in the development of a feasibility study. The first step is a screening evaluation of all possible technologies that would apply, in this case technologies to control AMD. The second step is a detailed analysis and comparison of selected and assembled technologies. EPA conducted a screening evaluation similar to the Boulder Creek OU, which considered the concepts of mine plugging, air sealing, groundwater control, capping, physical-chemical treatment/resource recovery, biological treatment, passive treatment, fixation-stabilization treatment of sludge, land-fill of sludge, surface-water discharge of treated water, and injection of treated water.

EPA has concluded that the site conditions in the Old/No. 8 Mine Seep OU restrict the number of alternatives to four general response actions:

- No Action
- Containment of the AMD and isolation of water and/or air from the sulfide rock
- Reduction in AMD discharge volume by reducing water infiltration into the mine workings
- Treatment of the AMD, disposal of sludge, and discharge of the treated water

EPA performed a screening analysis of the general alternatives. EPA concluded that only three alternatives have potential applicability to the Old/No. 8 Mine Seep AMD discharges. The Old/No. 8 Mine Seep FS includes detailed analysis and comparisons of:

- No Action

- Copper Cementation
- Treatment of the AMD, disposal of sludge, and discharge of the treated water

Following is a brief summary of the screening evaluation.

Because the No-Action alternative is required by the NCP, it is automatically forwarded to the detailed analysis.

The containment alternatives of mine plugging and air sealing were eliminated in the screening because the mine adits are not accessible, and it was concluded that construction activities to restore access would involve large costs and a great risk that access would not be achieved. The containment alternatives of groundwater control and capping were eliminated because the surface of the landslide deposits over the mine portals is too unstable to drill and maintain wells or to construct a permanent, impervious cap.

Treatment was considered both as a stand-alone response action and in combination with other technologies that would reduce the formation of AMD. Three technologies were considered for AMD treatment in the Old/No. 8 Mine Seep OUFS. The technologies are physical-chemical (resource recovery), biological, and passive.

The physical-chemical treatment systems considered were: ion exchange, liquid-liquid extraction, crystallization, and the membrane process. All of these treatment systems were screened out because of uncertainty of achieving cleanup goals and high capital and operating costs.

Copper cementation is currently being used to remove copper from the Old/No. 8 Mine Seep. Cementation is effective in reducing the copper concentrations but the process may not achieve the discharge standards for copper, and it does not reduce the concentrations of zinc and cadmium. Despite these limitations, copper cementation was judged to be technically and economically effective to complement other measures and for these reasons was retained for detailed analysis.

Neutralization/precipitation is a process that is commonly used by the mining industry for treatment of AMD and has been used successfully to reduce metals levels at the IMM site. Under the Boulder Creek ROD, it is anticipated that the final design will use a combination of high density sludge (HDS) treatment and a simple mix of AMD with soda/lime. EPA anticipates that the Richmond/Lawson treatment plant can be expanded to accommodate flow from the Old/No. 8 Mine Seep. EPA retained this process for the detailed analysis.

Microbial decomposition of waste materials requires natural or manmade wetlands, which are impractical in the Slickrock Creek valley. This innovative technology might play a supporting role in the final solution for the IMM site.

Passive treatment by evaporation requires large ponds, which are impractical in the Slickrock Creek valley. This technology is screened out.

The lime neutralization treatment processes generate sludge which can be conditioned to make it more resistant to leaching and then disposed of in a RCRA landfill or a municipal or mine waste disposal type landfill, depending on the sludge characteristics. In addition, the landfill could be onsite or offsite. These options were evaluated in the Boulder Creek OUFS. All of the disposal options are carried forward to the detailed analysis.

Water disposal options are discharge to Spring Creek, Slickrock Creek, to the Sacramento River, or injection of treated water into the mine or into the ground. Off-site disposal is screened out because it is more expensive than onsite disposal and yields the same resultant offsite water quality.

Injection and onsite surface disposal are retained for further consideration in the FS.

The general characteristics of each general response are summarized in Figures 2 and 3.

The technologies and options that have been screened out as infeasible are shown by boxes with cross-hatching. These options have been judged to be infeasible because of known technical limitations. It is unlikely that new information about the Iron Mountain Mine site or applications elsewhere would justify further consideration of these options.

The technologies and options that have been screened out because of inadequate precedent or inadequate information about their application to the Iron Mountain Mine site are shown by boxes with dashed lines. This screening is based largely upon a judgment that existing information does not provide a strong or complete case for successful application of this option. There is a possibility that additional information about the site or other applications may justify a future reexamination of these options and possibly their inclusion as part of adopted remedial alternatives. The Old/No. 8 Mine Seep OUFS relies in part upon the previous Boulder Creek ROD information and conclusions.

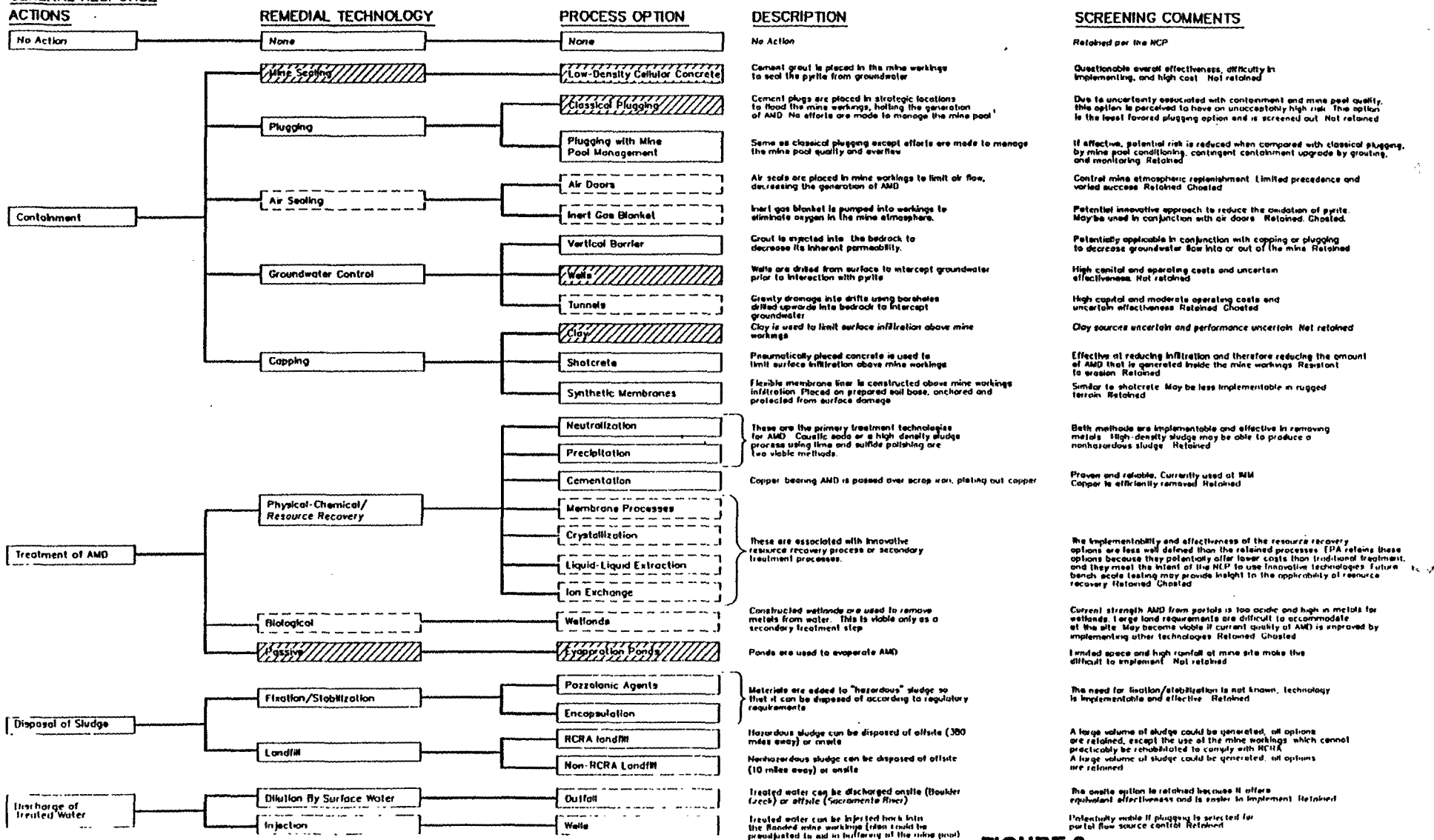
The feasibility study addressed three basic alternatives for control of the Old/No. 8 Mine Seep AMD. They are Alternative O/N8-0—No-Action, a mandated baseline alternative, Alternative O/N8-1—Treatment of Flow from Old/No. 8 Mine Seep, and Alternative O/N8-2—Copper Cementation of Flow from Old No. 8 Mine Seep. The main elements of these alternatives are described below.

### **VII.3 Alternative O/N8-0—No-Action**

The "No-Action" alternative, O/N8-0, is developed and evaluated as required by the NCP in 40 C.F.R. §300.430(e)(6).

The no-action alternative is commonly used as a baseline alternative against which other alternatives are judged. As the name implies, this alternative does not include

## GENERAL RESPONSE ACTIONS



### NOTES

1. TECHNOLOGIES AND PROCESS OPTIONS SCREENED OUT (NOT RETAINED) ARE SHOWN WITH HATCHING

2. DASHED BOXES REPRESENT OPTIONS THAT ARE NOT USED IN THIS OUTFIT BUT ARE NOT SCREENED OUT. THESE MAY BE USED AT THE SITE IN FUTURE REMEDIAL ACTIVITIES

RDD1238

AUGUST 1993

RDD68205 05 01

**FIGURE 2**  
**SCREENING OF REMEDIAL**  
**TECHNOLOGIES FOR MINE PORTALS**  
**IRON MOUNTAIN MINE OLD/NO. 8 MINE SEEP ROD**

**GENERAL RESPONSE  
ACTIONS**

**REMEDIAL TECHNOLOGY**

**PROCESS OPTION**

**DESCRIPTION**

**SCREENING COMMENTS**

No Action	None	None	No action	Retained per the NCP.
Containment	Capping	Shotcrete	Pneumatically applied concrete is used to limit surface infiltration on waste piles.	Effective at preventing or reducing erosion of the waste pile. Reduces potential for generation of AMD by reducing infiltration. Implementability depends on location of waste pile. Not retained.
		Clay	Clay is used to limit surface infiltration on waste piles.	Similar to shotcrete, but less resistant to erosion, and subject to desiccation cracking. Not retained.
		Geosynthetic Membrane *	Geosynthetic cap is constructed on waste piles.	Similar to shotcrete, but may require less maintenance. Retained
	Surface Controls	Grading	Mechanical equipment is used to reshape piles to limit surface-water run-on.	Not effective unless combined with diversion system. Not retained.
		Diversion Systems	Ditches or berms are used to limit surface-water run-on to the piles.	Should be effective at controlling erosion; is most effective in combination with capping. Retained.
Removal	Excavation	Backhoes and Bulldozers	Mechanical equipment is used to remove the piles.	Commonly used; effective and implementable. Retained.
Treatment	Stabilization	Pozzolonic Agents	Materials are added to meet regulatory requirements for disposal.	The need for stabilization is not yet known; the technology is implementable and effective. Retained.
	Resource Recovery/ Physical-Chemical	Flotation	Resource recovery treatment processes may be able to recover metals, plus generate a nonhazardous waste products. Some of these techniques were used previously to process ore at IMM.	The implementability and effectiveness of resource recovery is unknown, although removal efficiencies probably will be low. Not retained.
		Soil Washing		
		Neutralization		
Disposal	Landfill	RCRA Landfill	Hazardous materials can be disposed of offsite (300 miles away) or at a new facility onsite.	All options are retained, except the use of the mine workings, which cannot practicably be rehabilitated to comply with RCRA.
		Non-RCRA Landfill	Nonhazardous materials can be disposed of offsite (10 miles away) or at a new facility onsite.	All options are retained.

**NOTES**

1. TECHNOLOGIES AND PROCESS OPTIONS SCREENED OUT ARE SHOWN WITH HATCHING.
- 2 \* SELECTED REPRESENTATIVE PROCESS OPTIONS FOR ALTERNATIVE DEVELOPMENT.

**FIGURE 3  
SCREENING OF REMEDIAL  
TECHNOLOGIES FOR WASTE PILES  
IRON MOUNTAIN MINE OLD/NO. 8 MINE SEEP ROD**

any additional remediation activities. The no-action alternative would include provisions for limited monitoring, operation, and maintenance of the copper cementation plants and operation and maintenance of the projects constructed pursuant to EPA's 1986 ROD.

Without further remediation, the AMD production and discharge at Iron Mountain is expected to continue for centuries, until such time as the sulfide-rich mineralization is completely depleted. This geochemical process is expected to continue with the same or similar pattern and intensity of the current discharges for the foreseeable future.

#### **VII.4 Alternative O/N8-1--Treatment of Flow from Old/No. 8 Mine Seep**

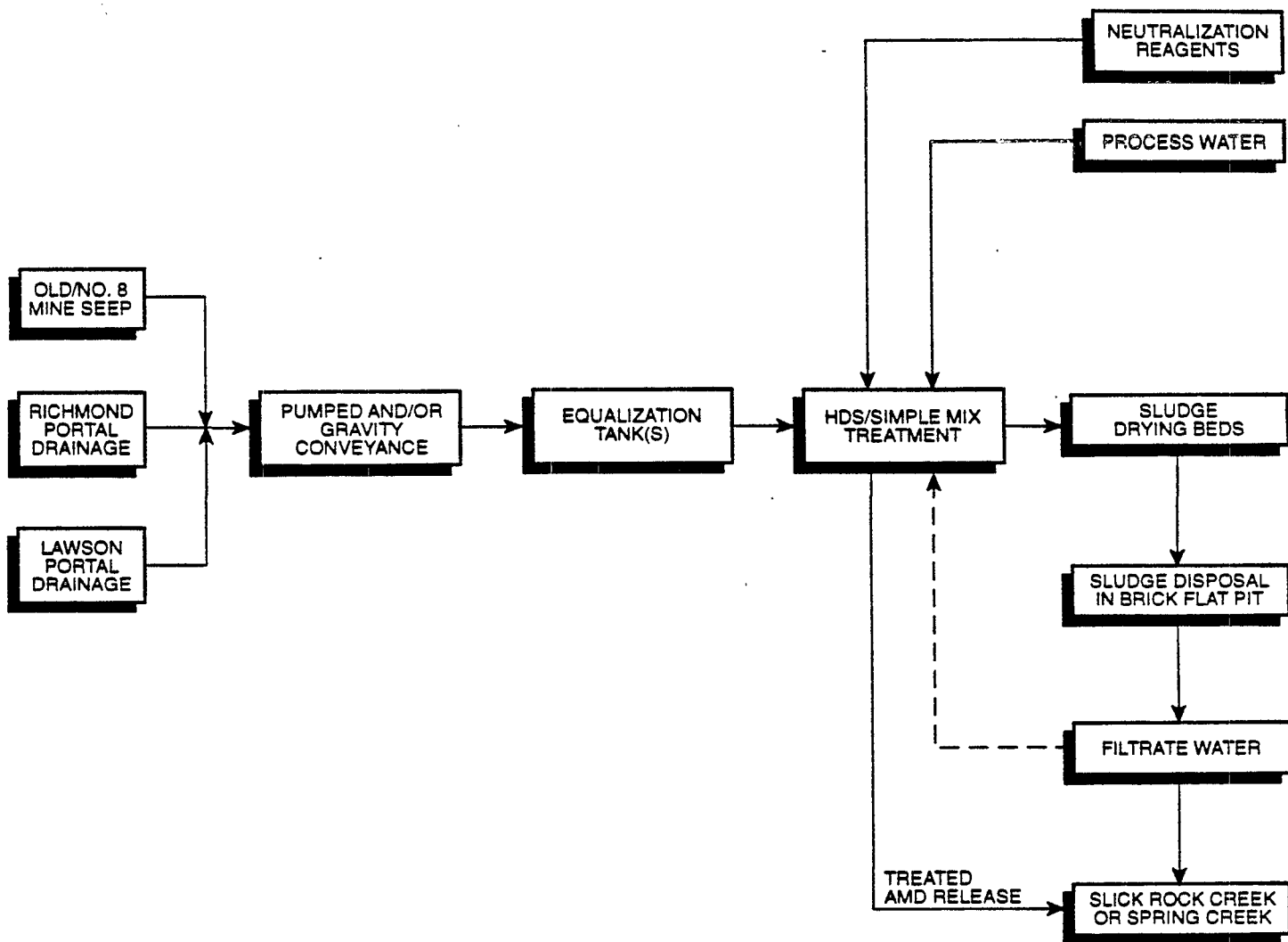
The 1992 ROD for the Boulder Creek OU selected treatment of the Richmond and Lawson portal flows using lime neutralization. The lime/sulfide high density sludge treatment process is specified for non-peak flows. (It is anticipated that the final design will provide that the system is switched to the simple mix treatment process for peak AMD flows.) All sludge disposal is in Brick Flat Pit. Detailed design of treatment processes for AMD are underway. As part of this design, EPA has performed a treatability study that indicates that the addition of sulfide during treatment may be counterproductive. EPA may modify its treatment approach to delete the requirements for the sulfide addition.

This alternative would entail collecting the Old/No. 8 Mine Seep AMD and pumping it to the treatment area at Minnesota Flats. The treatment facility under design includes equalization tanks, an optional copper cementation plant, and an HDS/simple mix treatment plant. Figure 4 is a conceptual schematic, and Figure 5 shows a block schematic of this treatment system.

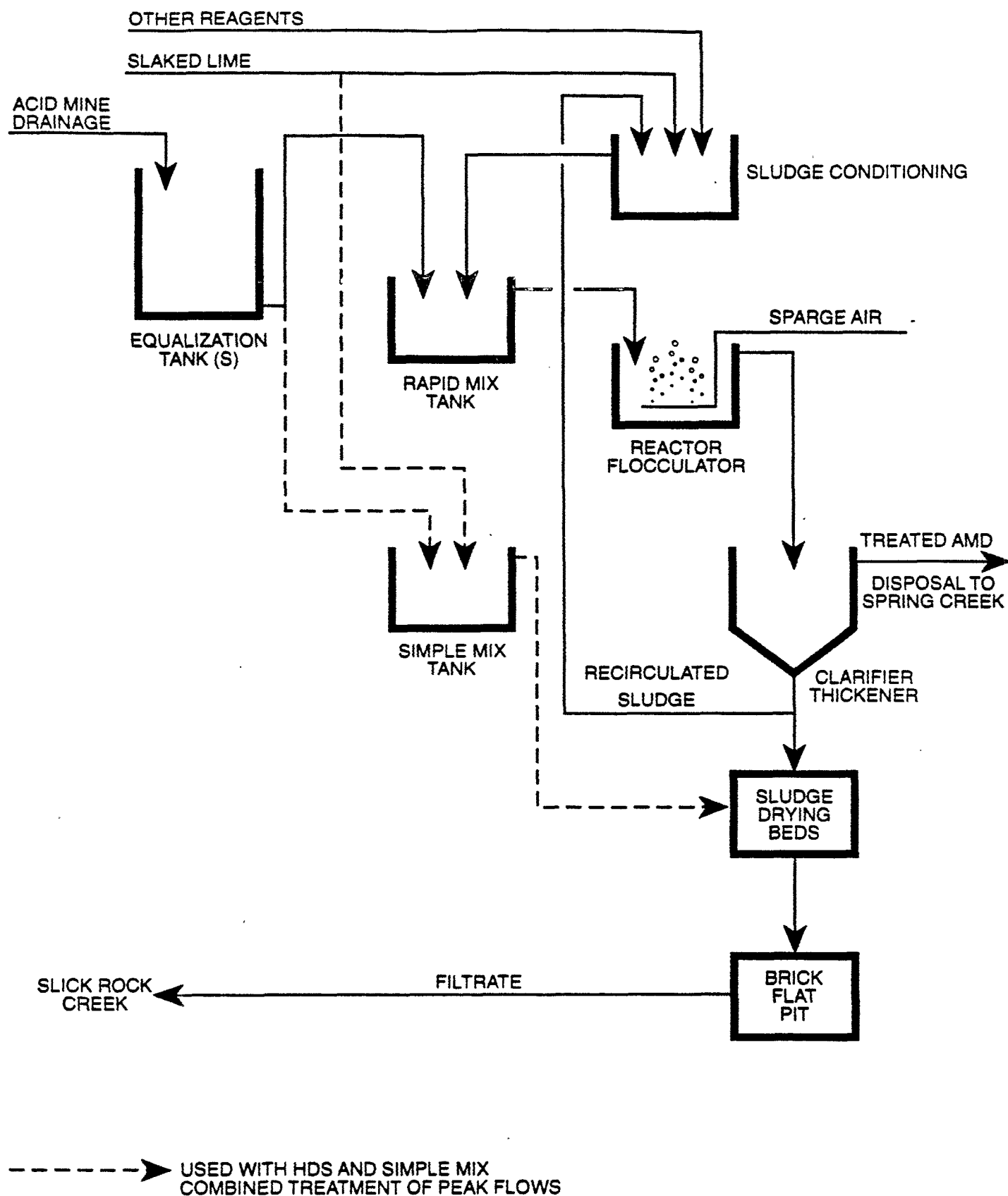
The capacity of the proposed treatment plant for the Boulder Creek OU would have to be enlarged to treat the additional base flows with HDS and to provide for treatment of peak flow from Old/No. 8 Mine Seep of 250 gpm. The following additional improvements would also be required:

- Access road to the Old/No. 8 Mine Seep
- Additional AMD and process water conveyance
- Additional 300,000 gallons of equalization tank capacity
- Additional electrical capacity for peak flows
- Additional sludge disposal capacity

The concept for collection of the AMD at Old/No. 8 Mine Seep is to provide both surface and underground interception of the flows and closed piping to bring the flows by gravity to a collection manhole and then to a measurement manhole near the present Slickrock Creek copper cementation plant. The AMD would then be pumped 24,000 feet in a 6-inch pipeline to discharge into an elevated tank at the Minnesota Flats treatment plant.



**FIGURE 4**  
**HDS/SIMPLE MIX LIME NEUTRALIZATION**  
IRON MOUNTAIN MINE OLD/NO. 8 SEEP ROD



**FIGURE 5**  
**GENERALIZED FLOW SCHEMATIC**  
**HDS/SIMPLE MIX TREATMENT**  
**OF ACID MINE DRAINAGE**  
 IRON MOUNTAIN MINE OLD/NO. 8 MINE SEEP ROD

The AMD flows from the three mines will be mixed in an equalization tank to make the flows more uniform for treatment. The equalization capacity proposed for the flow from Old/No. 8 Mine Seep would require approximately 300,000 gallons.

The treatment process is described in Appendix B of the 1992 Boulder Creek OU FS. The HDS process will be used to treat normal flows, but a conversion to simple mix treatment could be used to treat the peak storm flows to avoid equipping the plant with large equalization and HDS treatment facilities to handle short-term conditions. For the Boulder Creek OU, the HDS and simple mix treatment systems were sized at approximately 300 and 1,100 gpm, respectively. To incorporate treatment of Old/No. 8 Mine Seep AMD, the HDS and simple mix treatment system capacities will be increased to 420 and 1,250 gpm, respectively.

Sludge from the treatment will be disposed in Brick Flat Pit. Sludge will be dewatered at Minnesota Flats and hauled by truck to Brick Flat Pit for disposal.

This option does not rely upon copper cementation (Alternative O/N8-2), but could be designed to allow the continued operation of a copper cementation plant to remove copper upstream of the lime treatment facility. Although copper cementation is currently required for the AMD from Old Mine/No. 8, this form of treatment/metals recovery would no longer be necessary after construction of the treatment plant. After construction of the lime treatment plant it is anticipated that the owner/operator will operate the copper cementation plant only when the price of copper justifies such operation. This alternative would not preclude such operation.

#### **VII.5 Alternative O/N8-2—Copper Cementation**

This alternative entails the collection of the Old/No. 8 Mine Seep AMD, treatment by copper cementation, and effluent discharge to Slickrock Creek. This alternative would replace the existing copper cementation plant to increase the efficiency of copper removal. An observed peak flow of 250 gpm and an average flow of 60 gpm were used to size the new plant and estimate capital and operating costs. The AMD collection system is the same as for Alternative O/N8-1. The new copper cementation plant will be on the site of the present plant. Figure 6 shows the layout of these facilities.

The copper cementation treatment system relies on the electrochemical precipitation of metal (copper in this case) by a more electropositive metal (such as iron). Copper cementation involves passing copper-bearing AMD over scrap iron, where the copper deposits and iron go into solution as ferrous iron. When the scrap iron is replaced by copper, the copper is removed and sold for its scrap value. Two copper cementation plants currently operate at the site. The process is passive, requiring only periodic manual or mechanized removal of the iron-depleted, copper-enriched scrap iron and replacement with fresh scrap iron.

Cementation is carried out in acid-resistant chambers. The AMD flows through these chambers by gravity.

As shown by the operational history or the existing onsite plant and experience with more modern plants on other sites, it is assumed that the average removal efficiency will be 90 percent. This is an increase of 20 percent over the performance of the existing plant. Based upon an average inflow of copper of 120 mg/l, the improved plant efficiency would prevent an annual discharge of 6,000 pounds of copper. The existing plant and the plant proposed in this alternative provide no removal of zinc or cadmium.

## **VIII. ALTERNATIVE COMPARISONS**

The remedial alternatives developed in the Old/No. 8 Mine Seep OUFS were analyzed in detail using the nine evaluation criteria specified by the NCP in 40 C.F.R. §300.430(e)(9). The resulting strengths and weaknesses of the alternatives were then weighed to identify the alternative providing the best balance among the nine criteria. These criteria are: (1) overall protection of human health and the environment; (2) compliance with applicable or relevant and appropriate requirements (ARARs); (3) reduction of toxicity, mobility, or volume through treatment; (4) long-term effectiveness and permanence; (5) short-term effectiveness; (6) implementability; (7) cost; (8) state acceptance; and (9) community acceptance. Each of these criteria is described below.

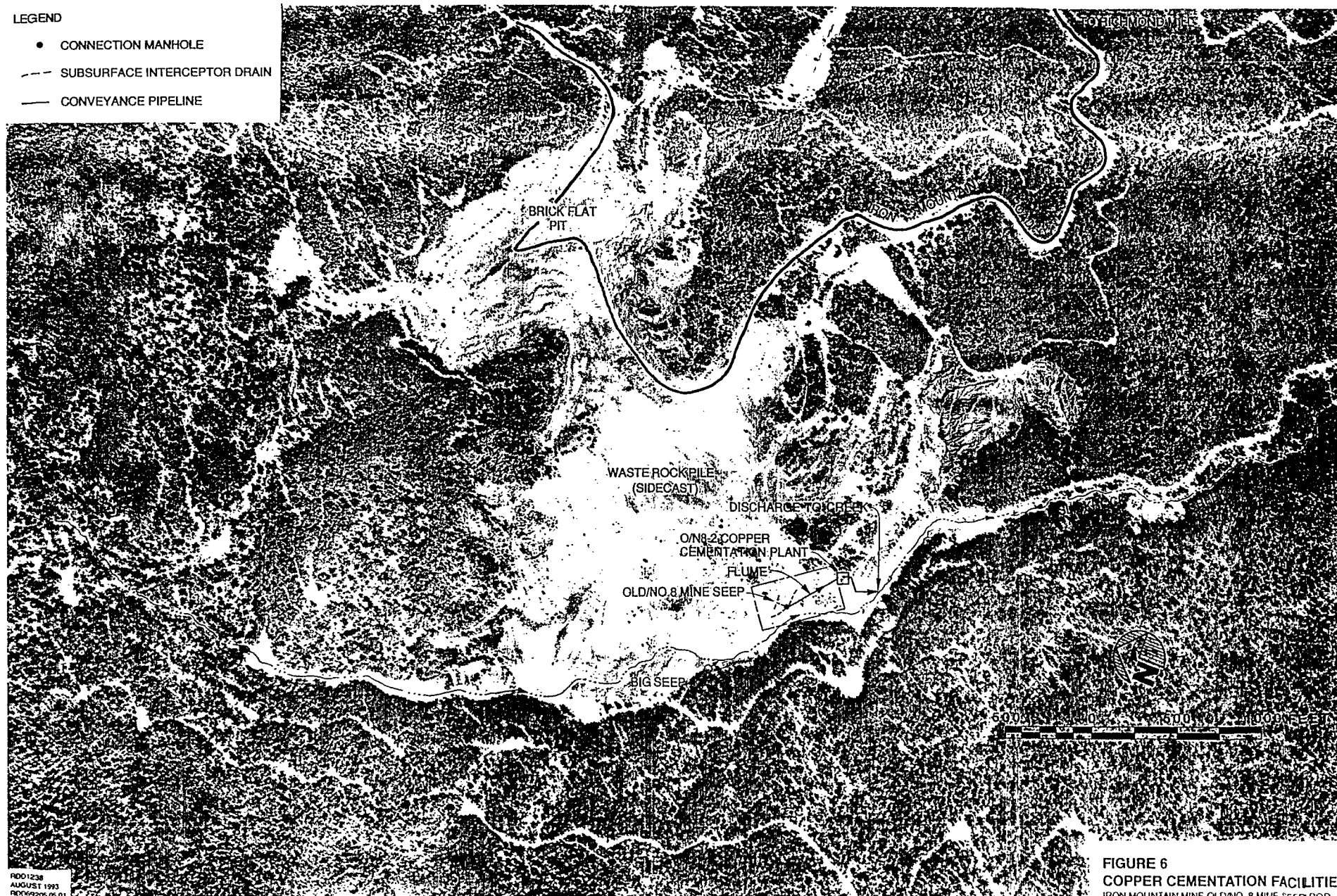
### **VIII.1 Criterion 1—Overall Protection of Human Health and the Environment**

Overall protection of human health and the environment addresses whether a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

The Old/No. 8 Mine Seep OU provides for an interim action that is not expected to be final, and will not address all of the sources of contaminant discharges from the site. Consequently, even though the remedial action will provide significant environmental benefit, it is not expected to be fully protective of human health and the environment. The remedial actions will address the third largest source of AMD at the site, the Old/No. 8 Mine Seep, and will provide a significant contribution toward the final site cleanup. The remedial actions considered are intended to provide protection of human health and the environment from the exposure pathway or threat posed by AMD from Old/No. 8 Mine Seep. The comparative analysis of the alternatives is made on this basis and on the basis of their contribution toward meeting the final cleanup goal.

LEGEND

- CONNECTION MANHOLE
- - - SUBSURFACE INTERCEPTOR DRAIN
- CONVEYANCE PIPELINE



Treatment of the AMD should contribute to protection of human health, although this is not considered a major issue for either the no-action or the action alternatives. It is not considered a major issue because the concentrated acidic waters are mainly limited to remote and uninhabited areas, these source areas have restricted entry, and human exposure to the dilute waters is limited.

The level of environmental protection among the alternatives considered ranges from limited to good. The no-action alternative provides only a continuation of the controls now in place, namely the existing flume for AMD conveyance, the cementation plant, and the Slickrock Creek Diversion. Effluent from the cementation plants will continue with undiminished zinc and cadmium, significantly reduced amounts of copper, and a low pH. Present impacts are likely to continue. Old/No. 8 Mine Seep degradation of Slickrock Creek and downstream impacts would continue.

Alternative O/N8-1 would neutralize the acidity of the Old/No. 8 Mine Seep AMD and remove more than 99 percent of the metals from the seep flow.

From a comparison of case years 1978, 1980, 1981, and 1983, the water at the Slickrock Creek confluence with Spring Creek, while considerably improved, would still not meet the water quality criteria for copper, cadmium, or zinc at all times. These years have a span of annual rainfall representative of all of the years of record. Below the confluence of the two creeks and below Keswick Dam, Alternative O/N8-1 would provide enough copper removal to allow the retention and controlled release of SCDD to achieve compliance with water-quality criteria for all of the case years 1980 and 1983, and greater compliance with the criteria than would occur under the no-action alternative in other years.

Construction of pipelines shall be conducted primarily along roads, resulting in minimal impact on vegetation. On the basis of this comparison, Alternative O/N8-1 would have a very positive impact on achieving the overall remedial action objectives for the site.

Alternative O/N8-2 would result in the removal of an additional 6,000 pounds of copper per year when compared with the no-action alternative. This additional removal of copper could potentially reduce the days of non-compliance associated with copper. However, copper cementation is not expected to reduce the amount of cadmium or zinc, which individually and in combination appear to be the cause of non-compliance at the confluence of Slickrock and Spring Creek.

In summary, the no-action alternative provides environmental protection that is limited to the removal of most copper only; the treatment alternative, O/N8-1, provides for a significant improvement in protection for aquatic resources in that it removes 99 percent of all metals, and the improved copper cementation alternative, O/N8-2, would improve copper removal but not provide protection from zinc or cadmium.

## **VIII.2 Criterion 2—Compliance with Applicable or Relevant and Appropriate Requirements**

Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal or State environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal or State environmental siting law that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well-suited to the particular site.

Compliance with ARARs addresses whether a remedy will meet all Federal and State environmental laws and/or provide a basis for a waiver from any of these laws. These ARARs are divided into chemical-specific, action-specific, and location-specific groups. Iron Mountain Mine ARARs are discussed in greater detail in Chapter 3 of the Old/No. 8 Mine Seep RI/FS, and in the September 30, 1992, ROD in Section X.2.

**Chemical-Specific ARARS.** For the purpose of comparative analysis, the Old/No. 8 Mine Seep OUFS considered compliance with three specific water quality goals at two locations for each of the alternatives. The three goals were:

- State of California water quality objectives in the Central Valley Regional Water Quality Control Board Basin Plan (CVRWQCB Basin Plan)—the most stringent water quality requirements.
- Federal Clean Water Act—ambient water quality criteria for protection of human health.
- Federal Clean Water Act—ambient water quality criteria for protection of aquatic life in freshwater.

The maximum contaminant levels specified by selected ARARs are presented in Table 2. The two points of compliance were:

- Confluence of Slickrock Creek with Spring Creek
- Sacramento River below Keswick Dam

The benefits of implementing the alternatives of Old/No. 8 Mine Seep OUFS were tested by estimating the water quality with each of the alternatives in operation under the patterns of precipitation in 1978, 1980, 1981, and 1983. The results indicate that Alternatives O/N8-1 and O/N8-2 would both reduce the days of non-compliance with respect to the no-action alternative, but neither would eliminate non-compliance. The modeling using the most stringent standard (CVRWQCB Basin Plan) for water quality

<b>Table 2</b> <b>Maximum Contaminant Levels Specified by Selected ARARs (<math>\mu\text{g/l}</math>)</b>			
<b>ARAR</b>	<b>Copper</b>	<b>Zinc</b>	<b>Cadmium</b>
California State Central Valley Water Quality Control Board Basin Plan	5.6	16	0.22
Federal Clean Water Act water quality criteria for protection of human health	1,300	none	10
Federal Clean Water Act ambient water quality criteria for protection of aquatic life in freshwater <sup>a</sup>	12.0	110	1.1
Safe Drinking Water Act	1,000	5,000	10
<sup>a</sup> Based on a water hardness of 100 mg/l. The values reported are for a 4-day average continuous concentration.			

below Keswick Dam predicted 52 days of non-compliance per year for the no-action alternative (O/N8-0) and copper cementation (O/N8-2) and 47 days for treatment of flows (O/N8-1). The model using the Federal Clean Water Act Ambient Water Quality Criteria below Keswick Dam shows 12 days of noncompliance for ON8-0, 9 days for ON8-1, and 11 days for ON8-2.

The Old/No. 8 Mine Seep OU provides for an interim action that it is not expected to be final and does not address all of the sources of discharges from the site. Therefore, it is not expected to fully comply with all ARARs with respect to water quality standards for metals concentrations in surface waters and State Fish and Game standards. Although the remedial actions evaluated in the Old/No. 8 Mine Seep OUFs provide for significant improvement by essentially eliminating the third largest discharge from the site, EPA is relying upon the ARARs waiver for "Interim Measures" (40 C.F.R. § 300.430 (f)(1)(ii)(C)(i) for remedy selection with respect to the Old/No. 8 Mine Seep OU and therefore is waiving the Regional Board's Basin Plan water quality objectives and the Fish and Game §5650 standards ARARs for this operable unit. EPA's overall goal at the site remains to achieve these water quality objectives and Fish and Game standards. The alternatives for this Operable Unit otherwise will comply with ARARs, including ARARs for sludge disposal.

ARARs are discussed in greater detail in the feasibility study for the Old/No. 8 Mine Seep Operable Unit (U.S. EPA, 1993).

The treatment of flow in an expanded treatment plant will make a significant contribution to the goal of complying with water quality standards. The no-action and O/N8-2 copper cementation alternatives are less effective because they do not remove cadmium and zinc.

**Location-Specific ARARs.** The Old/No. 8 Mine Seep OUFS provides a detailed description of possible location-specific ARAR's. All of the alternatives are expected to meet location-specific ARARs, some of which ensure that wetlands, historical, or archaeological sites are not damaged or disturbed.

**Action-Specific ARARS.** Significant action-specific ARARs include those that address the need to protect species and those that relate to the safe disposal of wastes. All three alternatives are consistent with statutes such as the Federal and California Endangered Species Acts and the Fish and Wildlife Coordination Acts and Fish and Game Code Section 1505. Alternatives O/N8-1 and O/N8-2 improve habitat and will therefore provide greater compliance.

Alternative O/N8-1 is the only alternative that would require disposal of sludge. The disposal unit at Brick Flat Pit is being designed by EPA to comply with the provisions of California Water Code Section 13172 and Health and Safety Code Section 25208, et seq. (Toxic Pit Control Act). These ARARs are applicable to the disposal of the sludge.

Table 3 is a summary of the alternatives' ability to meet objectives of protecting human health and the environment and achieving ARARs.

<b>Table 3</b> <b>Summary of Overall Protection of Human Health and the Environment</b> <b>and Achievement of ARARs</b>	
<b>Alternatives</b>	<b>Overall Protection of Human Health and the Environment and Achievement of ARARs</b>
O/N8-0 No-Action	<ul style="list-style-type: none"> <li>• Human health risk likely to be low.</li> <li>• Present environmental impacts are likely to continue and may increase in severity with prolonged exposure to contaminated water and increased volume of contaminated sediments.</li> <li>• Cementation removes about 70 percent of the copper, but does not remove other metals or reduce acidity.</li> <li>• Will not meet ARARs.</li> </ul>
O/N8-1 Treatment of Flow	<ul style="list-style-type: none"> <li>• Human health risk likely to be low.</li> <li>• Significant reduction in environmental impacts with up to 99 percent reduction in metals and acidity.</li> <li>• This interim action will not provide full compliance with ARARs.</li> <li>• The large anticipated reduction in metals in the discharges is a significant contribution to final cleanup standards</li> </ul>
O/N8-2 Copper Cementation of Flow	<ul style="list-style-type: none"> <li>• Similar to O/N8-0, with an additional removal of copper</li> <li>• This interim action will not provide full compliance with ARARs.</li> </ul>

### **VIII.3 Criterion 3—Long-Term Effectiveness and Permanence**

Long-term effectiveness and permanence refers to the ability of a remedy to maintain reliable protection of human health and the environment over time. This criterion includes the consideration of residual risk and the adequacy and reliability of controls.

All of the alternatives considered control the contaminated flow and have no effect on the geochemical reactions that generate the AMD. The alternatives will remain effective as long as the conveyance systems and treatment plant operations are maintained. For Alternative O/N8-1, assuring adequate disposal capacity is part of the long-term remedy. The current pit disposal has a capacity for at least 60 to 100 years.

### **VIII.4 Criterion 4—Reduction of Toxicity, Mobility, or Volume Through Treatment**

Reduction of toxicity, mobility, or volume through treatment refers to the preference for a remedy that uses treatment to reduce health hazards, contaminant migration, or the quantity of contaminants at the site.

Geochemical reactions are anticipated to continue for hundreds of years unless alternative technologies are developed, adequately tested, and applied to the site. The no-action alternative will continue to reduce flow toxicity associated with copper, and the copper cementation will improve on this reduction by removing additional copper. Alternative O/N8-1 will reduce flow toxicity associated with copper, zinc, cadmium, and low pH. Alternatives O/N8-0 and O/N8-2 do not reduce the mobility, toxicity, or volume of zinc and cadmium, but will reduce the volume of copper without requiring disposal. All metals treated at Minnesota Flat (O/N8-1) will have reduced mobility and will be appropriately disposed of in Brick Flat Pit. Brick Flat will be equipped with an underdrain system further limiting any future remobilization of metals.

In summary, the comparison is essentially between not addressing the actual AMD toxicity and mobility for zinc, cadmium, and pH in Alternative O/N8-0 and O/N8-2 and the potential mobility of 99 percent of all metals treated and disposed of as a sludge in compliance with disposal standards. O/N8-1 will provide a greater overall reduction in AMD toxicity, mobility, and volume through treatment.

### **VIII.5 Criterion 5—Short-Term Effectiveness**

Short-term effectiveness refers to the period of time required to complete the remedy and any adverse impacts on human health and the environment that may be posed during the construction and implementation of the remedy.

Alternative O/N8-1 ranks first in short-term effectiveness as it provides the greatest improvement in surface-water quality and does not involve unusual worker or environmental risks. Alternative O/N8-2 is less effective than O/N8-1, but it is better than O/N8-0. It also has no unusual worker or environmental risks.

## VIII.6 Criterion 6—Implementability

Implementability refers to the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement the chosen solution. It also includes coordination of Federal, State, and local governments to clean up the site.

Alternatives O/N8-1 and O/N8-2 are also fairly simple to implement in that they involve established technologies with known costs, effectiveness, and reliability. Alternative O/N8-1 is somewhat more complex than O/N8-2 because it requires sludge disposal. All of the alternatives are easily reversible in the event other technologies become available.

## VIII.7 Criterion 7—Cost

This criterion examines the estimated costs for each remedial alternative. For comparison, capital and annual O&M costs are used to calculate a 30-year present worth cost for each alternative.

Table 4 presents estimates of the 30-year present worth for the alternatives. The table shows the present worth of the initial capital investment, 30 years of operation, and the total 30-year cost. The 30-year basis is selected merely to compare the early costs of all alternatives. Unless another remedial action is subsequently developed which obviates the need for continued treatment, treatment of the seep is expected to be required beyond the 30-year costing period. The total present worth costs range from \$8.3 million for O/N8-1 to \$1.7 million for Alternative O/N8-2. It is commonly assumed that actual cost may vary from the stated amounts by as much as plus 50 percent to minus 30 percent.

Table 4 Summary of Costs			
Alternatives	Present Worth Basis		
	Capital Costs (\$)	Operating Costs (\$)	Total Costs (\$)
O/N8-0 No-Action	-0-	446,000	446,000
O/N8-1 Treat seep flow at a treatment plant co-located with the Boulder Creek operable unit plant	4,350,000	3,920,000	8,270,000
O/N8-2 Treat seep flow with a new copper cementation plant located near the seep	905,000	753,000	1,658,000

### **VIII.8 Criterion 8—State Acceptance**

State acceptance refers to the State's position and key concerns related to the preferred alternative and other alternatives, and State comments on ARARs or the proposed use of waivers.

EPA has worked closely throughout the Old/No. 8 Mine Seep OU with the California Department of Toxic Substances Control (DTSC) (the State lead agency), the Regional Water Quality Control Board (RWQCB), and the Department of Fish and Game. All three agencies support the selection of EPA's preferred alternative, treatment of the Old/No. 8 Mine Seep AMD flows.

In an April 15, 1993, letter, DTSC supported the selection and implementation of treatment. The Department urged EPA to implement this remedy as soon as possible to allow for its integration with ongoing design and construction of the Boulder Creek OU treatment plant. DTSC views treatment as an interim remedy and encourages the further development and consideration of an alternative that could reduce or eliminate the need for treatment at the site, including capping, plugging, and resource recovery approaches. DTSC expressed concern that the disposal facility for the treatment residuals be properly designed. EPA has agreed that the disposal facility must meet the appropriate design criteria.

The Department of Fish and Game signed an April 14, 1993, letter along with the other Natural Resource Trustees for the site, supporting the selection of treatment of the Old/No. 8 Mine Seep AMD discharges. These agencies recommend that EPA proceed expeditiously with additional site investigations and cleanup actions.

### **VIII.9 Criterion 9—Community Acceptance**

This criterion refers to the community's stated preferences through verbal and written comments on EPA's Proposed Plan regarding which components of the alternatives interested persons in the community support, have reservations about, or oppose.

There was significant community interest in EPA's Proposed Plan for the Old/No. 8 Mine Seep OU at IMM. EPA's public meeting was attended by approximately 100 people. EPA received three oral comments at the meeting. EPA received letters commenting on the Proposed Plan. In general, the community expressed interest in selecting a remedy that would safely protect the water and fishery resources that could be implemented quickly, and that could remediate permanently the long-standing site problems.

There was overwhelming support from the community to take immediate action at the site. The community supported treatment of the AMD discharges as a logical

extension of EPA's September 1992 ROD. The community supports the use of the inactive open pit mine, Brick Flat Pit, for sludge disposal.

Zeneca, on behalf of Rhone-Poulenc Basic Chemicals, submitted detailed comments in support of its conclusion that operation of the existing copper cementation plant, the no-action alternative (O/N8-0), was the preferred approach and could be safely implemented, would be effective, and was the lowest-cost option.

Iron Mountain Mines, Inc., (IMMI) submitted detailed comments in support of its preferred approach, in situ mining of the mineralized zones. IMMI opposed EPA's reliance upon Brick Flat Pit for sludge disposal. IMMI stated its interest in mining the remaining sulfide deposit in Brick Flat Pit.

Responses to the above comments are presented in the attached Responsiveness Summary.

## **IX. THE SELECTED REMEDY**

EPA is selecting collection and treatment of the Old/No. 8 Mine Seep AMD flows. Treatment sludges will be disposed of onsite in the inactive open pit mine, Brick Flat Pit.

The selected remedy differs in one minor respect from the preferred alternative in EPA's February 11, 1993, Proposed Plan. EPA is selecting the preferred alternative of the Proposed Plan, treatment by chemical neutralization/precipitation with HDS process option. EPA is not requiring use of sulfide based upon treatability study results from the design work for the Boulder Creek treatment plant. Peak AMD flows could be treated with a simple mix treatment plant, consistent with the process configuration selected for the Boulder Creek treatment plant.

The major components of the selected remedy include:

- Collection structures, pipelines, and equalization to provide for delivery of all AMD flows from the Old/No. 8 Mine Seep to the treatment facility for treatment.
- Additional or expanded treatment facilities to perform chemical neutralization/precipitation treatment of the Old/No. 8 Mine Seep AMD flows at the Minnesota Flats plant site. The treatment plant effluent shall meet the effluent limitations of 40 C.F.R. §§440.102(a) and 440.103(a). Except for pH and TSS levels for discharges into Boulder Creek, Slickrock Creek, or contaminated parts of Spring Creek, EPA has determined that these standards are relevant and appropriate in this application. If the discharge is made to one of these creeks, it will not be possible to adjust the pH due to the expected acidity in the creeks. Treatment for TSS levels would not be practicable due to the high levels of

TSS already in the creeks. If the discharge is made to Flat Creek, which is not expected to be acidic from other sources, the pH and TSS standards would be relevant and appropriate.

EPA has selected treatment Alternative O/N8-1, the HDS process option, as the required treatment technology option. The HDS process option, as discussed in the Boulder Creek OUFS, relies upon simple mix treatment and equalization for peak flows beyond the capacity of the HDS plant. The HDS plant shall be designed to provide capacity to treat sustained elevated flows from the Old/No. 8 Mine Seep. In conducting design studies for the plant, EPA has concluded that the HDS plant may be designed with a simple mix peaking plant.

- Disposal of treatment residuals onsite in the inactive open pit mine, Brick Flat Pit. Brick Flat Pit shall be modified to comply with the applicable requirements of the Toxic Pits Control Act, Health and Safety Code §25208, et seq., and California requirements for disposal of mining wastes promulgated under Water Code Section 13172.

The collection and conveyance systems shall provide for delivery of all base, sustained, and peak AMD discharges from the Richmond and Lawson adits. The treatment plant shall provide equalization capacity, treatment capacity, or a combination of both to ensure that all of the AMD flows are treated in compliance with the performance standards. The conveyance and treatment facility design shall provide for excess capacity and redundancy of elements necessary to assure reliability of performance.

The routing of pipelines and siting of tankage and treatment facilities is expected to have minimal impacts on the undisturbed habitat. The historic mining-related disturbance is significant, caused by collapse of the underground workings, surface mining, and establishment of roadways and cleared work areas. Pipeline routing and design and siting of facilities shall minimize impacts on undisturbed habitat by use of existing cleared work areas and roadways to the maximum extent practicable and by avoidance of siting of any facilities in areas of riparian or wetland habitat.

EPA has selected the HDS process option (O/N8-1) for the following reasons:

- The HDS process produces treatment sludges with superior characteristics with respect to dewatering and leachability. The smaller volumes of denser sludge are expected to significantly increase the life of Brick Flat Pit for use as an onsite sludge disposal facility. The superior leaching characteristics may allow for reduced regulatory requirements on the design of the modifications to Brick Flat Pit for sludge disposal.
- The sludge from an HDS plant could be placed in Brick Flat Pit dry. Although Brick Flat Pit modification designs must address several significant issues such as storm runoff, the design for placement of HDS

sludges is significantly less complicated, and its operation is more within conventional engineering practice.

- EPA has chosen to site the treatment plant downgradient of the AMD discharges. The reliance upon HDS for treatment of base flows will reduce the annual O&M cost for hauling sludges to Brick Flat Pit for disposal by a significant amount. EPA has concluded that siting at a downgradient location could be more easily engineered to assure reliable operations. The use of the HDS process option may make this alternative site cost-effective by significantly reducing the volumes of sludge that must be trucked to Brick Flat Pit for disposal.

Use of the same treatment plant as the Boulder Creek OU will save additional construction and operation costs.

For the HDS process treatment facility located at the Minnesota Flats site, the treatment plant would discharge to lower Spring Creek and shall meet the requirements of 40 CFR §440.102(a) and §440.103(a), except pH and TSS standards. Because lower Spring Creek will not attain ambient water quality criteria pursuant to remedial actions being performed in the Old/No. 8 Mine Seep OU, EPA is invoking the ARARs waiver for "interim measures" provided by the NCP at 40 CFR 300.430(f)(1)(ii)(C)(1). EPA is not requiring that the discharge from the treatment plant meet the ambient water quality criteria in lower Spring Creek for this interim action.

For the HDS treatment facility located at Minnesota Flats, it is relevant and appropriate to provide protection of the Flat Creek drainage, including meeting the effluent limitation for pH and TSS at 40 CFR §440.102(a). Flat Creek does not currently meet all ambient water quality criteria (AWQC) and Basin Plan water quality standards due to a pollution source on Upper Spring Creek, the Stowell Mine. Once this source is remediated by RWQCB, EPA expects that Flat Creek could meet AWQC and water quality standards. Therefore, discharges from the dewatering of sludge that do not meet AWQC must be prevented from entering Flat Creek. Proper design of the dewatering ponds is an economically viable option, although mechanical dewatering can also be considered.

Brick Flat Pit must be modified to function as a safe, long-term disposal site for treatment plant sludges. The remedial design of the disposal facility in Brick Flat Pit shall address and comply with the requirements of the Toxic Pits Control Act and the California mining waste requirements. The discharge from Brick Flat Pit shall comply with California mining waste requirements. Because Boulder Creek and Slickrock Creek do not currently comply with ambient water quality criteria, and remediation of sources in the interim action pursuant to the Old/No. 8 Mine Seep OU will not allow for compliance with these standards without further actions, EPA is relying upon a waiver for "interim measures" and is not requiring that the discharge from Brick Flat Pit meet ambient water quality criteria in surface waters receiving the discharge.

Some modifications and refinements may be made to the remedy during remedial design and construction. Such modifications or refinements, in general, would reflect the results of the engineering design process. Estimated cost for the remedy is \$10.4 million. Details of the costs for the treatment component are shown in Table 5, and capital costs and O&M costs are shown in Table 6.

## X. STATUTORY DETERMINATIONS

EPA's primary responsibility at Superfund sites is to select remedial actions that are protective of human health and the environment. CERCLA also requires that the selected remedial action for the site comply with applicable or relevant and appropriate environmental standards established under Federal and State environmental laws, unless a waiver is granted. The selected remedy must also be cost-effective and use permanent treatment technologies or resource recovery technologies to the maximum extent practicable. The statute also contains a preference for remedies that include treatment as a principal element. The following sections discuss how the selected remedy for the Old/No. 8 Mine Seep OU at the Iron Mountain Mine site meets these statutory requirements.

<b>Table 5</b> <b>Incremental Cost Summary for Alternative O/N8-1 (\$ x 1,000)</b>	
<b>Component</b>	<b>Incremental Cost</b>
Site Preparation and Access Roads	56
AMD and Process Water Conveyance System	1,362
Treatment Plant (Including Equalization and Copper Cementation)	677
Brick Flat Pit Improvements	200
Construction Subtotal	2,295
Bid Contingencies (10 percent)	230
Scope Contingencies (30 percent)	689
General Contingencies (8 percent)	184
Construction Total	3,398
Permitting and Legal (3 percent)	102
Services During Construction (10 percent)	340
Total Implementation Cost	3,840
Engineering Design Cost (15 percent of Construction Total)	510
Total Incremental Capital Cost	4,350
30-Year Present Worth of Incremental O&M Costs (Interest = 5 percent)	3,920
Total 30-Year Incremental Present Worth (Interest = 5 percent)	8,270

<b>Table 6</b> <b>Incremental Annual Operation and Maintenance Cost</b> <b>Summary for Alternative O/N8-1 (\$ x 1,000)</b>	
<b>Component</b>	<b>Incremental O&amp;M Cost</b>
Access Roads	9
AMD and Process Water Conveyance	75
Treatment Plant (Including Equalization and Copper Cementation)	147
Sludge Disposal at Brick Flat Pit	24
Total Yearly Incremental O&M	255
Total Incremental Present Worth of 30-year O&M (Interest = 5 percent)	3,920

### **X.1 Protection of Human Health and the Environment**

The selected remedy protects human health and the environment from the exposure pathways that are being addressed in this interim action. The selected remedy addresses the AMD discharges from the Old/No. 8 Mine Seep. The human health threat posed by this source is small and related to direct contact or ingestion of the AMD, which is unlikely due to the remote location, rugged topography, and restriction of access to the property. The environmental threats posed by this source are the very significant releases of copper, cadmium, zinc, and acidity into surface waters. The selected remedy will essentially eliminate the discharges from the source being addressed in this interim action. The Old/No. 8 Mine Seep is a very effective collector of the AMD that is believed to originate in the Old Mine and No. 8 Mine workings. Treatment of the discharges is expected to reduce the copper, cadmium, and zinc by greater than 99 percent.

The Old/No. 8 Mine Seep OU provides for an interim action that is not expected to be final and does not address all of the sources of discharges from the site. The selected remedy therefore cannot be expected to be fully protective of the environment in those areas affected by other discharges.

### **X.2 Compliance with ARARs**

The selected remedy for the Old/No. 8 Mine Seep OU provides for an interim remedial action for a specific source at the site. The selected remedy provides for

significant progress toward meeting the objectives of the Superfund cleanup action at Iron Mountain Mine by providing for significant reductions in the discharges of copper, cadmium, zinc, and acidity from the site. In particular, the remedy will result in better water quality in the Sacramento River and reduce the number of days each year that the Sacramento River exceeds State Basin Plan standards due to discharges of copper, cadmium and zinc from IMM. This section discusses the ARARs which the action shall meet and identifies the ARARs which are being waived.

The Old/No. 8 Mine Seep AMD discharge is similar in its nature and characteristics to the Richmond and Lawson portal AMD discharges which were addressed in the September 30, 1992, Record of Decision (ROD) for the Boulder Creek Operable Unit at IMM. The September 30, 1992, ROD thoroughly discusses the ARARs for this type of source, AMD containing high concentrations of copper, cadmium, and zinc, and also discusses the ARARs for the selected remedy, treatment with onsite sludge disposal or discharge of the treated effluent to lower Spring Creek. The September 30, 1992, ROD discussion regarding ARARs in Section X.2 is incorporated fully by reference. The discussion below summarizes the compliance of the selected remedy for the Old/No. 8 Mine Seep OU with ARARs.

**X.2.1 AMD Discharge.** The components of the selected remedy to address the Old/No. 8 Mine Seep AMD discharge are collection, treatment, and disposal of treatment residues onsite. This action shall comply with the following ARARs in the manner described:

**X.2.1.1 Chemical-Specific ARARs.** Chemical-specific ARARs for the selected treatment remedy include the Clean Water Act effluent limitations for discharges of mine drainage from copper mines, exercise of best professional judgment under the Clean Water Act, Safe Drinking Water Act Maximum Contaminant Levels (MCLs), and non-zero Maximum Contaminant Level Goals (MCLGs) at the water intake to the City of Redding, and the Basin Plan water quality objectives.

The primary adverse environmental impact from the IMM discharges is the impact on surface waters and the species which live in those waters. CERCLA provisions respecting water quality criteria and the requirements of the Clean Water Act and California Water Code are ARARs for the Site.

In the final remedy, any discharge from the mine to surface waters should comply with the water quality objectives in the Central Valley Regional Water Quality Control Board's Basin Plan. In determining the manner in which the mine discharges should be controlled to achieve these levels, EPA may use best professional judgment (BPJ) to determine the level of control. In addition to the use of BPJ to achieve the water quality objectives in the receiving waters, EPA considers effluent limitations on related mining activities as relevant and appropriate.

The selected treatment remedy for the Old/No. 8 Mine Seep OU will comply with the following chemical-specific ARARs:

- Substantive requirements of NPDES permitting or substantive requirements regarding Waste Discharge Requirements
- Use of BPJ to establish effluent limitations where there is no regulation of the specific discharge
- The BPT and best available technology (BAT) limits for point sources at copper and zinc mines (40 CFR §§440.102(a) and 440.103(a) (for treatment plant discharges to lower Spring Creek, EPA has determined that the limits for pH and TSS are not "relevant and appropriate")
- MCLs and non-zero MCLGs established under the Safe Drinking Water Act for the Sacramento River near Redding's Jewel Creek intake

The selected treatment remedy for the Old/No. 8 Mine Seep is an interim remedy and does not address all of the sources of contamination at the site. Treatment of the Old/No. 8 Mine Seep AMD discharge, in combination with other remedies already selected for the site, cannot assure compliance with all ARARs. Further actions will be required. The selected remedy will comply with all ARARs to the extent practicable in the context of the interim remedial action. However, EPA expects that it is necessary to waive the following ARARs for the interim remedial action:

- The water quality objectives of California's Central Valley Basin Plan for the Sacramento River and its tributaries above the State Highway 32 bridge
- Water quality objectives of the California Inland Surface Waters Plan

**X.2.1.2 Action-Specific ARARs.** The selected remedy shall address and comply with all action-specific ARARs. Significant action-specific ARARs include those relating to disposal of the treatment sludge and ARARs directing activity to protect affected fisheries and habitat.

Selection of this alternative is consistent with statutes such as the Federal and California Endangered Species Act and the Fish and Wildlife Coordination Acts because the remedial alternative is being developed pursuant to a process of consultation like that required by the Acts. The alternative would also comply with Fish and Game Code Section 1505, since the improved water quality should result in greater protection of fishery habitat in the Sacramento River below Keswick Dam.

The disposal unit used for the treatment residue should comply with the applicable provisions of California Water Code Section 13172 and Health and Safety Code Section 25208, et seq. (Toxic Pits Control Act, or TPCA). The Regional Board mining waste requirements are ARARs which are applicable to the disposal of the treatment residue. It is expected that chemical analysis of the treatment residues from the HDS plant will indicate that the wastes are properly categorized as Group B wastes.

Although the HDS sludge will be less aqueous than the simple mix sludge, it may still contain free liquids subject to TPCA provisions.

Consequently, the unit must not be located in a Holocene fault; shall be located outside areas of rapid geologic change; shall require flood-plain protection from a 100-year peak streamflow; shall have liners and a filtrate collection system; shall have precipitation and drainage controls for a 10-year, 24-hour storm; and shall comply with specific monitoring requirements.

Insofar as the sludge contains free liquids, the disposal unit must also comply with TPCA, which prohibits discharge of free liquids into a surface impoundment unless the surface impoundment does not pollute or threaten to pollute the waters of the State. If the treatment sludge contains free liquids, the design of the disposal unit must be such that the unit does not pose a threat to pollute the waters of the State.

**X.2.1.3 Location-Specific ARARs.** The selected remedy shall address and is expected to comply with all location-specific ARARs. EPA has determined that the RCRA requirements for management of hazardous wastes, including siting and construction criteria, are not relevant and appropriate to the management and disposal of residuals from treatment of the AMD discharges or the waste piles. EPA is employing a variance from Hazardous Waste Control Law requirements for disposal of the non-RCRA waste. Accordingly, the selected remedy shall comply with requirements of the Toxic Pits Control Act and California requirements for management and disposal of mining wastes, including siting and technology requirements for disposal facilities.

The action shall comply with the following location-specific ARARs:

- Archeological and Historic Preservation Act
- National Historic Preservation Act
- Clean Water Act (Section 404)
- Executive Order on Floodplain Management
- Executive Order on Protection of Wetlands

**X.2.2 ARAR Waivers For this Operable Unit.** This section summarizes which ARARs are subject to ARAR waivers. Because the Old/No. 8 Mine Seep Operable Unit is an interim remedy, it can qualify for the ARAR waiver for such actions. CERCLA §121(d)(4)(A), 42 U.S.C. §9621(d)(4)(A), provides that ARARs may be waived if "the remedial action selected is only part of a total remedial action that will attain such level or standards of control when completed."

The ARARs which are being waived for purposes of this operable unit are:

- The Basin Plan water quality objectives, discussed in detail below. Because the treatment plant does not address all sources that are contributing to the exceedances of the water quality objectives, it is not pos

sible to fully comply with ARARs until further response actions are selected and implemented.

- Fish and Game Code Section 5650, which prohibits "permit[ting] to pass into...the waters of this State...substance or material deleterious to fish, plant life, or bird life." Because the treatment plant would not address all sources at this site, this alternative would not eliminate all releases. It would, however, eliminate 99 percent of the material passing into the waters from the two portal sources.

The overall remedy, including the activities in the 1986 Record of Decision, the 1992 Boulder Creek Record of Decision, this Operable Unit, and subsequent operable units are expected to achieve compliance with these ARARs (at least in those portions of the site immediately below Keswick Dam).

EPA has previously stated that the Old/No. 8 Mine Seep Operable Unit will be followed by other studies and remedial actions to address matters such as releases from Slickrock Creek nonpoint sources and the sediments in the Spring Creek arm of Keswick Reservoir. Those activities are not a part of this OU. The Old/No. 8 Mine Seep Operable Unit, however, is not expected to achieve this ARAR in all years without the planned further remedial action. As such, it is an interim remedy. In the event of an interim remedy, EPA may elect to invoke an interim remedial action waiver as provided in CERCLA §121(d)(4)(A), 42 U.S.C. §9621(d)(4)(A).

There is also some question regarding the technical practicability of meeting water quality objectives in certain segments of Boulder, Slickrock, and Spring Creeks. In particular, it may not be technically practicable to meet the water quality objectives in certain portions of these creeks. In such a case, EPA may consider the use of a waiver under CERCLA §121(d)(4)(C), 42 U.S.C. §9621(d)(4)(C). The preamble to the NCP discusses the use of the technical impracticability waiver at 55 Fed. Reg. 8748 (March 8, 1990). The main criteria for invoking this ARAR waiver are engineering feasibility and reliability. EPA explained in the preamble that cost plays a "subordinate role" in determining whether a remedial action is "practicable from an engineering perspective." Id. Because this action is an interim remedial action, EPA is not today reaching any conclusions regarding the technical impracticability of achieving ARAR compliance in Boulder, Slickrock, and Spring Creeks, but is invoking the interim remedy waiver for all stream segments.

The selected remedy will not provide for compliance with the applicable chemical-specific ARARs of the Central Valley Regional Water Quality Control Basin Plan water quality objectives, as discussed above. The selected remedy will allow for compliance with these water quality objectives most of the time and represents a significant improvement compared to the no-action alternative, O/N8-0. The selected remedy will not provide for meeting water quality objectives in Slickrock Creek.

Subsequent remedial measures will address other sources of contamination that prevent achievement of the water quality objectives in the Sacramento River. A subsequent study will also address whether or not a waiver for technological impracticability is appropriate for water quality objectives in the creeks adjacent to Iron Mountain Mine.

### **X.3 Cost-Effectiveness**

EPA has concluded that the selected remedy is cost-effective in mitigating the risk posed by the discharge of heavy-metal-laden AMD from the Old/No. 8 Mine Seep to surface waters. Section 300.430(f)(ii)(D) of the NCP requires EPA to evaluate cost-effectiveness by comparing all the alternatives against three additional balancing criteria: long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; and short-term effectiveness. The selected remedy meets these criteria and provides for effectiveness in proportion to its cost. The estimated cost for the selected HDS treatment remedy is \$8.3 million.

### **X.4 Utilization of Permanent Solutions and Alternative Technologies or Resource Recovery Technologies to the Maximum Extent Practicable**

EPA has determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be employed in a cost-effective manner for the interim remedial action for the Old/No. 8 Mine Seep OU at Iron Mountain Mine.

EPA recognizes that the mineralization at Iron Mountain Mine will continue to generate AMD unless additional remedial actions are developed, evaluated, and selected for implementation to reduce or eliminate the AMD-forming reactions. Treatment does not address the reactions themselves. Treatment effectively addresses the resultant discharges. EPA has developed and evaluated alternatives as part of the ongoing remedial investigation and feasibility study activities at IMM that could reduce or eliminate the AMD-forming reactions. Resource recovery alternatives have also been proposed and evaluated. EPA has concluded that further information is required to be developed and evaluated before one of these approaches could be selected for implementation. The needed further information would address technical feasibility, implementability, effectiveness, and cost-effectiveness concerns and risk factors with respect to these approaches. EPA encourages the further development of alternatives that could control the AMD-forming reactions and resource recovery alternatives for future evaluation and potential selection in a subsequent action.

The selected remedy will provide for a significant reduction in the copper, cadmium, zinc, and acidity discharges from the site. The current water supply and fishery conditions are critical. There is a critical need to implement controls on these discharges as soon as possible, while studies are ongoing with respect to further source control or resource recovery approaches. Treatment is effective, a part of each approach developed to date, and is consistent with implementation of a subsequent action.

**X.4.1 Preference for Treatment as a Principal Element.** Although EPA is not selecting a remedy which treats the source such that no further AMD is formed, EPA is using treatment to reduce the toxicity and mobility of the AMD which is being generated. By selecting the HDS treatment process instead of the simple mix treatment process, the AMD treatment will also reduce the expected volume of the sludge. HDS sludge will also be less toxic than the simple mix sludge.

Mine sealing or plugging alternatives present the potential to completely stop the AMD-forming reactions and the discharge if the surrounding rock mass can contain a mine pool at elevations sufficient to inundate all mineralization. The plugging alternatives might (with innovative approaches) address acidic metal-laden salts that dissolve in the flooding mine pool and thus are mobilized and create a discharge pathway through fractures or mining-related openings. A partially successful plugging alternative would reduce the AMD-forming reactions, but not eliminate them. A partially successful program presents risks of release of contaminants to the environment.

Other alternatives such as intercepting groundwater flow and capping areas which channel infiltrating water toward mineralization would likely reduce the rate of reaction of the AMD formation, but not eliminate them. These alternatives provide less risk of creating new discharge pathways and rely on conventional engineering approaches.

Resource recovery approaches merely treat the discharge, recovering economic values. Conventional treatment is effective at eliminating the discharge, but does not treat the sources of the discharge.

EPA encourages the continued development and evaluation of alternatives that may partially satisfy the preference for treatment as a principal element, and this issue will be addressed in the final decision document for the site. EPA has concluded that further development and evaluation of the above approaches is necessary to address uncertainties with respect to technical feasibility, implementability, effectiveness, cost-effectiveness concerns, and risk factors.

## **XI. DOCUMENTATION OF SIGNIFICANT CHANGES**

EPA is today approving the Proposed Plan. There are no significant changes.

EPA will locate the Old/No. 8 Mine Seep treatment plant at Minnesota Flat. As EPA proposed in its February 11, 1993, Proposed Plan for the Old/No. 8 Mine Seep OU, EPA will co-locate the Old/No. 8 Mine Seep treatment plant with the Boulder Creek treatment plant to take advantage of cost savings that can be realized from this approach. EPA has selected Minnesota Flat for the plant site based upon cost and reliability considerations developed and evaluated in detail during design of the Boulder Creek treatment plant. In conducting treatability studies for the plant, EPA has concluded that it is not necessary to require that sulfide be used in the treatment process. Treatability studies have shown that the addition of sulfide hinders the formation of the HDS sludges. Since the same plant and process will be used for the discharges from this OU, sulfide will not be required for treatment.

**DEPARTMENT OF TOXIC SUBSTANCES CONTROL**

## REGION 1

10151 CROYDON WAY, SUITE 3  
SACRAMENTO, CA 95827-2106  
(916) 255-3545



September 9, 1993

Mr. Dave Jones  
U.S. Environmental Protection Agency  
Region IX  
75 Hawthorne Street  
San Francisco, California 94105

IRON MOUNTAIN MINE; AGENCY REVIEW DRAFT, OLD/NUMBER 8 MINE RECORD  
OF DECISION

Dear Mr. Jones:

We have received the agency review draft of the Old/Number 8 operable unit Record of Decision (ROD) for the Iron Mountain Mine Superfund Project. We concur with the U. S. Environmental Protection Agency's (EPA) interim remedy selection of treatment for the acid mine drainage flows emanating from the Old/Number 8 Mine Seep. We agree that Minnesota Flats appears to be a suitable location for the treatment plant and that Brick Flat Pit, after modification to comply with the Toxic Pits Control Act, California Water Code, Section 13172 and the regulations adopted thereunder, appears to be a suitable location for permanent disposal of sludges.

At this point in time, however, we are unable to concur with the selection of the high density sludge (HDS) treatment method. In principle, we agree that HDS is a preferable treatment methodology due to its reputedly superior sludge characteristics. Those characteristics, when compared to the sludge generated by the simple mix process, include higher solids content (lower resultant sludge volume), superior handling and disposal characteristics and superior dewatering/leachate characteristics. But in light of Stauffer Management Company's (SMC) representations and plans with regard to the construction of a 300 gallon per minute aerated simple mix plant (which doubles as a 1400 gallon per minute partially aerated simple mix plant), we have insufficient information upon which to base a conclusion that HDS is necessary.



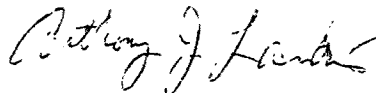
Mr. Dave Jones  
September 9, 1993  
Page Two

We envision the following actions at the site:

1. SMC should construct the plant as required by EPA Order 93-1 (as proposed to be amended in EPA's July 15, 1993 letter to SMC and SMC's July 27, 1993 letter to EPA) and the State's Order I/&SE 93/94 002 (as proposed to be amended in our August 10, 1993 letter to SMC).
2. Facilities to convey the Old/Number 8 Mine Seep Acid Mine Drainage flows to the treatment plant be constructed in the summer of 1994 as required by the State's Order I/&SE 93/94 002.
3. Performance of the treatment plant will be monitored in accordance with an approved monitoring plan during the rainy season of 1994/1995. Optimal operational parameters will be determined during this time frame.
4. If conditions warrant, i.e., the quantities and quality of the sludge generated by the SMC plant prove to be unmanageable, the HDS plant is then constructed.

If you have any questions or concerns, please call me or Mr. Duncan Austin at (916) 255-3706.

Sincerely,



Anthony J. Landis, P.E., Chief  
Site Mitigation Branch

cc: Mr. James Pedri  
Regional Water Quality Control Board  
415 Knollcrest Drive  
Redding, California 96002

Mr. Harry Rectenwald  
California Department of Fish and Game  
601 Locust Street  
Redding, California 96001



IN REPLY REFER TO:

## United States Department of the Interior

OFFICE OF THE SECRETARY  
Office of Environmental Affairs  
600 Harrison Street, Suite 515  
San Francisco, California 94107-1376



August 31, 1993

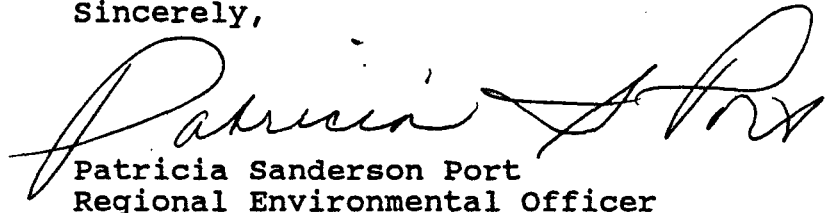
Mr. Rick Sugarek  
Region IX  
Environmental Protection Agency H-6-2  
75 Hawthorne St.  
San Francisco, CA 94105

Dear Mr. Sugarek:

Thank you for the opportunity to review the Record of Decision presenting interim remedial actions for discharges from the Old/No. 8 Mines. While we agree with the selection of treatment technology as the interim remedy, we are concerned that by concentrating on the single seep, other discharge points are escaping capture by the system. Each such discharge in Slickrock Creek that escapes capture and treatment is eventually collected at Spring Creek Debris Dam and increases the need for dilution water.

We suggest that if such a remedy is selected, that it include efforts to collect more of the discharge. Alternatives include placement of the treatment facility downstream or collection at the seep site itself (in much the same way as a spring would be developed).

Sincerely,



Patricia Sanderson Port  
Regional Environmental Officer

cc:  
Kris Doebbler, BR  
Roger Helm, FWS  
Denise Klimas, NOAA  
Harry Rectinwald, CA Fish and Game



**U.S. DEPARTMENT OF COMMERCE**  
**National Oceanic and Atmospheric Administration**  
National Ocean Service  
Office of Ocean Resources Conservation and Assessment  
Hazardous Materials Response and Assessment Division  
Coastal Resources Coordination Branch

September 7, 1993

Mr. Rick Sugarek (H-6-2)  
U.S. Environmental Protection Agency  
Region IX  
75 Hawthorne Street  
San Francisco, CA 94105

**Subject:** Review of the Iron Mountain Mine Old/No. 8 Mine Operable Unit Draft Record of Decision.

Dear Mr. Sugarek:

The Natural Resources Trustee Council for the Iron Mountain Mine Superfund site, comprised of the National Oceanic and Atmospheric Administration, the National Marine Fisheries Service, the Department of Interior Office of Environmental Affairs, the U.S. Fish and Wildlife Service, the U.S. Bureau of Reclamation, and the California Department of Fish and Game, has reviewed the August 6, 1993 Agency Review Draft Record of Decision (ROD) for the Old/No. 8 Seep at Iron Mountain Mine (IMM). The Natural Resources Trustees previously commented on the agency review draft of the Remedial Investigation/Feasibility Study for the Operable Unit. The alternative selected in the ROD is consistent with the treatment alternative recommended by the Natural Resource Trustee Council in the April 8, 1993 letter. However, we believe that the details on the amount of contamination that is collected for treatment is not consistent with our earlier recommendation. We also have some comments on the details of implementing the selected alternative and some comments on technical discussions contained in the document.

The Operable Unit is defined as the Old and No. 8 Mines. We believe that because these mines are buried by tens of feet of loosely consolidated landslide material, there is more contamination coming from the mines than is accounted for by the most obvious seep that is the focus of the remedial action. The ROD should disclose how the releases from this buried, leaking, flooded ore body travel through several known or potential migration routes to surface waters. The amount of contamination from the source (Old/No. 8 Mine Operable Unit) that will be treated by remedial action will depend upon the efficiency of the collection system for the discharge from the buried mines. We recommend developing the most effective design possible for collecting acid mine discharge (AMD) from the buried and flooded mine workings.

We believe that maximizing the collection of the contaminants from this flooded mine pool (Operable Unit) is consistent with the National Contingency Plan (NCP). Reducing the contamination better satisfies the evaluation criteria, including protection of the environment, long- and short-term effectiveness, and compliance with Applicable or Relevant and Appropriate Requirements.

**Specific Comments:**

Page 2, 2nd Paragraph, 1st Sentence: The subject seeps are emerging from the north slope of Slickrock Valley or the south facing slope of Iron Mountain.



Page 2, 3rd Paragraph: The ROD correctly describes the Sacramento River winter-run chinook salmon as listed Threatened by the National Marine Fisheries Service under the Federal Endangered Species Act; you should include also that the species has been listed as Endangered by the State of California, under the California Endangered Species Act.

Page 2, Paragraph 5, Second Sentence: The diversion of upper Spring Creek is into Flat Creek and is not in the Boulder Creek drainage.

Page 18, 2nd Paragraph: This discussion should disclose that contamination from the Old/No. 8 Mine workings Operable Unit has many known and potential migration routes to the surface waters in the Slickrock Creek drainage. We believe this is the case, considering the fact that the releases from this mine pool must first flow through several tens of feet of loosely consolidated landslide material before reaching the surface. After AMD from the flooded mine pool emerges through the buried mine portal, it can diffuse throughout the landslide formation. There is evidence that seeps down-gradient from the main identified seep have a chemical characteristic and flow pattern similar to the main seep, indicating a common source (Old/No. 8 Mine Operable Unit).

We believe that the selected remedy for this Operable Unit should be designed to abate as much of the contamination originating from this source that is possible. It appears that the site would lend itself to designs that would pass the implementability evaluation criteria in the NCP. It would be most prudent to establish collection systems at an elevation at least as deep as the buried mine portals.

Page 19, 1st Paragraph, 2nd Sentence: The fish toxicity should be described as acute toxicity, rather than just toxicity, because chronic toxicity levels are much lower than the values specified here. Acute toxicity also occurs at concentrations lower than those specified in this discussion, especially if the concentrations referred to are in the form of dissolved metals.

Page 21, 4th Paragraph, 3rd Sentence: Fishery data in this discussion is outdated. During and prior to the recent, extended drought, the salmon and steelhead were undergoing a decline that at that time produced a population that was only 50 percent the size of the earlier populations. The drought greatly accelerated this ongoing decline, producing escapements of salmon in the upper Sacramento River during the 1990's that are now only 20 percent of the levels observed during the late 1950's.

Page 22, 1st Paragraph, 3rd Sentence: The flood control releases from Shasta Reservoir described here should be qualified as **high volume** flood control releases. This qualification will avoid confusion with other flood control operations at Shasta Dam that produce a very low volume release to prevent compounding ongoing flooding of downstream areas in the Central Valley. This low volume release operation has produced catastrophic fish kills in the past, because it does not encourage downstream migration and reduces dilution of toxicant.

Page 22, 2nd Paragraph, 1st Sentence: Spring-run chinook and early spawning fall-run chinook have also exhibited this pattern of concentrating spawning activity in the cooler uppermost river reaches that are more susceptible to metal toxicity.

Page 22, 3rd Paragraph: The risk to resident trout and steelhead is overall less than that for salmon due to the fact that the sensitive early life stages of trout and steelhead are predominantly located in tributaries to the Sacramento River that do not receive the toxicant.

Page 31, 1st Paragraph, 1st Sentence: The concept for collection of AMD at the Old/No. 8 Seep is intended to provide both surface and underground interception of the flows. We believe it is important to collect the AMD emanating from these ore bodies to the **maximum extent possible**, in order to comply with the nine evaluation criteria specified by the National

Contingency Plan (40 CFR §300.430 (e)(9)). See also above comment concerning Page 18, 2nd Paragraph.

Page 52, 1st Paragraph, last sentence: The Natural Resource Trustees have previously commented on the failure of a mine plugging program similar to that described in this section. One of the greatest risks to biological resources in general, and the ESA listed winter-run chinook salmon in particular, is the likelihood that contaminants from the leaking mine pool would be released in a manner that would be uncollectible or only fractionally collectable for treatment. This, in our opinion, represents a severe risk. This risk should be included in this discussion.

If you have any questions regarding these comments, please contact one of the following:

- 1) Ms. Patricia Port, Office of Environmental Affairs, U.S. Department of the Interior, San Francisco, CA (415) 744-4090
- 2) Ms. Denise Klimas, National Oceanic and Atmospheric Administration, San Francisco CA (415) 744-3126
- 3) Mr. Roger Wolcott, National Marine Fisheries Service, Santa Rosa, CA (707) 578-7513
- 4) Mr. Jim Haas, U.S. Fish and Wildlife Service, Sacramento, CA (916) 978-4866
- 5) Ms. Kris Doebbler, U.S. Bureau of Reclamation, Sacramento, CA (916) 978-5046
- 6) Mr. Richard Elliott, Regional Manager, California Department of Fish and Game, Redding, CA (916) 225-2364

Sincerely,

DEPARTMENT OF THE INTERIOR

BY: 

Patricia Port, Regional Environmental Officer  
Office of Environmental Affairs  
600 Harrison Street, Suite 515  
San Francisco, CA 94107-1373

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

BY: 

Denise M. Klimas, Coastal Resources Coordinator  
National Oceanic and Atmospheric Administration  
Hazardous Materials Response and Assessment Division  
75 Hawthorne Street (H-1-2)  
San Francisco, CA 94105

NATIONAL MARINE FISHERIES SERVICE

BY: 

Gary Matlock, Ph.D., Acting Regional Director  
National Marine Fisheries Service  
501 West Ocean Blvd., Suite 4200  
Long Beach, CA 90802-4213

U.S. FISH AND WILDLIFE SERVICE

BY: 

Richard L. Jachowski, Acting Field Supervisor  
Ecological Services  
2800 Cottage Way, Room E-1803  
Sacramento, CA 95825

U.S. BUREAU OF RECLAMATION

BY: 

Roger Patterson, Regional Director  
U.S. Bureau of Reclamation  
2800 Cottage Way  
Sacramento, CA 95825

CALIFORNIA DEPARTMENT OF FISH AND GAME

BY: 

Boyd Gibbons, Director  
California Department of Fish and Game  
1416 Ninth Street  
Sacramento, CA 95815

cc: Ms. Katherine Pease, NOAA  
Ms. Robin Kohn Glazer, DOI  
Ms. Sara Russell, California AG

## CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

## CENTRAL VALLEY REGION

415 Knollcrest Drive, Suite 100

Redding, CA 96002

PHONE: (916) 224-4845

FAX: (916) 224-4857



17 September 1993

Mr. David Jones  
U. S. Environmental Protection Agency  
Region 9  
75 Hawthorne Street  
San Francisco, CA 94105

**DRAFT ROD - OLD/NO. 8 SEEP**

We have reviewed the agency draft of the Record of Decision (ROD) for the Old/No. 8 mine seep.

We concur with the selection of neutralization treatment as an interim remedy for control of acid and metals emanating from the Old/No. 8 mine seep. As discussed in the DTSC response letter (9 September 1993), we are not at this time recommending a specific treatment process. We concur with the DTSC proposal to evaluate sludge characteristics from the aerated simple mix plant and then determine if HDS is warranted. Given the relatively high cost of treatment and the problems with sludge disposal, efforts should be made to replace treatment technology at the earliest possible date with remedial action which prevents or reduces the formation of acid mine drainage.

The Slickrock Creek basin in the vicinity of Old/No. 8 mine has been shown to be a significant source of additional Cu loading from Iron Mt. Mine. We request that there be a continued effort to identify the actual source of this additional Cu load and an evaluation of feasible control actions.

If you have any questions, please contact Dennis Heiman of my staff at (916) 224-4851, or the above address.

James C. Pedri, P.E.  
Supervising Engineer

DRH:tch

cc: Mr. Anthony Landis, DTSC, Sacramento  
Mr. Harry Rectenwald, Department of Fish and Game, Region 1, Redding

ATTACHMENT B  
CONCEPT DESIGN  
FOR  
OLD/NO. 8 MINE SEEP  
COLLECTION, CONVEYANCE AND TREATMENT FACILITIES

**TECHNICAL MEMORANDUM**

---

**PREPARED BY:** Richard F. Coon / CH2M HILL  
John Spitzley/ CH2M HILL

**DATE:** April 19, 1994

**SUBJECT:** Old/No. 8 Mine Seep  
Collection, Conveyance & Treatment  
Iron Mountain Mine

**PROJECT:** SWE69205.04.01

**Background**

EPA signed the second Record of Decision (ROD) for the Iron Mountain Mine Superfund site on September 30, 1992. The 1992 ROD focused on the Boulder Creek Operable Unit (OU) which includes the two largest contaminant discharges from the site. The 1992 ROD selected the treatment of the acid mine drainage (AMD) discharges from the Richmond and Lawson portals. The 1992 ROD also addressed remediation of seven waste piles. The selected remedy for treatment of the Richmond and Lawson portal AMD discharges required the collection, conveyance, and treatment of all AMD flows from these two sources. EPA required treatment of the "sustained elevated" AMD flows by the high density sludge (HDS) treatment process. EPA required treatment of the peak AMD discharges by a Simple Mix lime neutralization treatment process. Treatment sludge are to be landfilled in a disposal facility to be constructed at Brick Flat Pit, an inactive open pit mine at the top of Iron Mountain.

Pursuant to an EPA Unilateral Administrative Order, Order 93-01, the Simple Mix treatment plant and associated facilities are currently being constructed by Stauffer Management Company (SMC), respondents on behalf of Rhone-Poulenc. EPA, under an agreement with SMC, is currently designing the HDS components of the treatment facility for the Boulder Creek OU. The conveyance and treatment facilities are expected to become operational in July, 1994.

EPA signed a third ROD for the Iron Mountain Mine site on September 24, 1993. The 1993 ROD selected collection, conveyance, and treatment of the Old/No. 8 Mine Seep (ON8MS) AMD discharge, the third largest contaminant discharge from the site. The selected remedy requires the "construction of necessary structures, pipelines, pumping stations, and equalization to provide delivery of all AMD flows from the ON8MS to the treatment facility, treatment facilities to perform chemical neutralization/ precipitation treatment of all of the ON8MS AMD using the lime high density sludge (HDS)/Simple Mix treatment process option" and "disposal of treatment residuals in the inactive open pit mine, Brick Flat Pit."

# MEMORANDUM

Page 2

April 19, 1994

The collection and conveyance facilities required in the 1993 ROD will bypass the Slickrock Creek Copper Cementation Plant which has been used in recent years to treat AMD for copper removal before its discharge into Slickrock Creek.

During 1993, as part of site remedial investigations, SMC has drilled three deep wells, installed several pumps and has operated the pumps to lower the acid-bearing waters in a near-surface part of the No. 8 Mine. This sustained pumping program has caused the ON8MS to dry-up and may have decreased the acidity and metals content of groundwater in the adjacent reach of Slickrock Creek. AMD pumped from the ON8MS has been treated by the Slickrock Copper Cementation Plant prior to discharge.

This technical memorandum contains the criteria for design, construction and operation of the permanent collection and conveyance facilities required to implement the 1993 ROD for ON8MS AMD. The memorandum also addresses the coordination of treatment and sludge disposal activities for this action with those of the Boulder Creek Operable Unit remedial action.

## General Design Requirements

The facilities to be developed in response to this directive shall be designed for long-term exposure to AMD with intermediate periods of full exposure to the atmosphere including AMD vapors and salts formed as AMD evaporates. As noted in EPA Order 93-01, the AMD can be generally characterized as a sulfuric acid solution with a concentration of 1 to 7 percent by weight, with approximately 1 percent iron and small concentrations of other ions, and a temperature of 50 to 130 degrees F. The AMD may contain varying quantities of precipitates and mineral particles.

The facilities proposed, designed and constructed in response to this directive shall meet the following general requirements:

- o Materials shall meet the requirements of Order 93-01, Attachment H or substitutions specifically approved by EPA.
- o The materials shall typically have a 30-year service life and equipment a 15-year service life unless a lower anticipated service life has been specifically approved by EPA.
- o Design and construction details shall provide for high reliability with minimum maintenance

# MEMORANDUM

Page 3

April 19, 1994

## AMD Collection System

AMD has discharged from the ON8MS over the past many years. During this time, a major portion of this seep has been collected and conveyed in an open channel to a copper removal plant. A significant portion of the seep may have escaped collection under the historic conditions and found its way into Slickrock Creek. The ON8MS is currently collected by way of a submerged pump in a well installed by SMC into a portion of the No. 8 Mine as part of their remedial investigation activities in 1993. This approach has proven effective and relatively reliable with the temporary facilities that are in use.

The permanent collection facilities required by Order 94-01 to implement the 1993 ROD may rely on either of the following two approaches:

- Adaptation of the historic method of capturing AMD discharges at the seep. Adaptations would be required to assure that all AMD flows are captured. Necessary pipelines and facilities to deliver the ON8MS AMD flows to the ON8MS conveyance system pipeline should be required.
- Adaption of the approach taken by SMC as part of their remedial investigations, which relies on a submerged pump in a well installed into the No. 8 Mine. Adaptations would be required to assure the reliability of this system to deliver all ON8MS AMD flows to the ON8MS conveyance system.

The plan proposed by respondents to order 94-01 shall comply with following requirements:

- A pumping system or an open channel collection system which can be demonstrated to provide reliable service, collect all ON8MS AMD flows, and deliver these flows to ON8MS AMD conveyance system. The ON8MS historic peak flow was recorded as 231 gpm.
- A pumping system must have an on-line pump capable of continuous operation and a backup pump which can be placed into continuous service in less than 8 hours. The operational plan shall provide for the replacement of the backup pump within two weeks of replacing the on-line pump.
- o A pumping system must be supplied by a power line installed and service by the local electric utility. Standby diesel power will be required unless a

## **MEMORANDUM**

Page 4

April 19, 1994

high reliability can be demonstrated for this utility power line.

### **Conveyance System**

The conveyance shall be a mainly buried pipeline in an abandoned railway embankment from the Old/No. 8 Mine Seep to the temporary treatment plant site and in the Iron Mountain Mine Road from the temporary treatment plant site to the junction with the existing Boulder Creek AMD pipeline. The abandoned railroad embankment terminates several thousand feet downstream of the Old/No. 8 Mine Seep and has a number of local unstable or potentially unstable reaches.

### **Pipeline Alignment**

Specific requirements for the pipeline alignment are:

As the preferred approach,

- Develop a continuous, all weather roadway between the temporary treatment plant site and the existing copper cementation plant suitable for occasional single-lane traffic with light trucks for inspection and repair of the pipeline and ON8MS collection facilities. Respondents to Order 94-01 may submit engineering and cost information regarding other approaches than the preferred approach.
- Provide a completely buried pipeline on the inside or cut-slope side of the railway bench and the cut-slope side of the Iron Mountain Mine Road
- Provide upslope control of storm-water flows where erosion or sedimentation can affect the long-term use of the bench for a roadway and a buried pipeline.
- Provide culverts and remove deteriorated timber cribbing which may affect the long-term use of the bench for a roadway and a buried pipeline.
- Provide downslope erosion control and stabilizing measures to ensure the long-term stability of the bench for a roadway and a buried pipeline

# MEMORANDUM

Page 5

April 19, 1994

## Pipeline Design

Respondents may propose for EPA review, a conveyance system that relies on pressure flow only, open channel flow only, or a combination of pressure and open channel flow pipeline. The systems shall comply with the following requirements:

- o Pressure and open channel flow system shall have a demonstrated capacity to convey all ON8MS AMD. Peak AMD flow has been historically recorded as 231 gpm.
- o The size, materials and installation details of pipeline for open-channel flow service shall be selected to provide reliable conveyance of AMD with reasonable allowances for sediment and precipitate accumulations and aging of the pipe. Likewise the size, materials, pressure rating and installation details of pipeline for pressure-flow service will address the same range of AMD characteristics, potential partial blockages, and pipeline deterioration.
- o The pipeline installation shall provide protection of the pipe from damage caused by factors including freezing temperatures, ground subsidence vehicular traffic, and vandalism. The pipeline installation shall facilitate repair.
- o Provide a leak detection system.

## Equalization

Flow control and equalization storage will be required to allow for repair of facilities to ensure adequate treatment of the AMD entering the HDS plant and to avoid spills of untreated water at the plant. Flow control will involve manual and remotely controlled shutoff of pumps and flows in the conveyance pipeline.

Equalization, in the case of a deep-well pumping system, can be achieved by stoppage of the pumps while the mine water levels are lower than the level of measurable surface or subsurface spillage of AMD into Slickrock Creek or the alluvium below Slickrock Creek or by off-line temporary storage in lined basins at the temporary treatment facility and tankage at the Minnesota Flats treatment plant. Equalization in the case of an open channel flow system will be limited to lined basins at the temporary treatment plant and tankage at the Minnesota Flats treatment plant.

# MEMORANDUM

Page 6

April 19, 1994

## Treatment

Respondents shall demonstrate whether the Boulder Creek ASM treatment plant has sufficient hydraulic capacity to treat the combined flow of the Boulder Creek AMD and Old/No. 8 Mine Seep AMD. The respondents shall demonstrate that the existing Minnesota Flats ASM treatment plant has sufficient oxidation capacity to fully oxidize the "sustained elevated" AMD flows from the Richmond, Lawson, and Old/No. 8 Mine Seep discharges.

Respondents shall demonstrate whether the existing Minnesota Flats treatment plant sludge drying beds provide sufficient capacity to dewater treatment sludges from the treatment of the Richmond, Lawson, and Old No. 8 Mine Seep AMD discharges. If respondents fail to adequately demonstrate the adequacy of the existing systems to perform treatment of all Richmond, Lawson, and Old/No. 8 Mine Seep Discharges, then respondents shall design and construct additional capacity in accordance with the requirements and design criteria of Order 93-01 for those facilities.

## Monitoring and Reporting Requirements

The following monitoring parameters and reporting frequencies are anticipated for AMD collection and conveyance facilities:

- Flow measurements at the upstream end of the conveyance from Old/No. 8 Mine Seep (continuous measurements, monthly reporting of daily averages)
- Flow measurements into and exiting each equalization facility (continuous measurements during flows, monthly reporting of daily averages)
- Flow measurements into the receiving facility at the treatment plant (continuous measurements, monthly reporting of daily averages)
- Water quality measurements for Copper, Cadmium, Zinc and pH for samples collected at the Old/No. 8 Mine Seep. (Weekly measurements November 1 through April 30, monthly measurements all other months)
- Modification of the existing Operations and Maintenance plan to include sampling and reporting requirements for the Old/No. 8 Mine Seep flows.